THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXXVIII. No. 2169.] LONDON, DECEMBER 6, 1904. [56TH YEAR. PRICE 6d.

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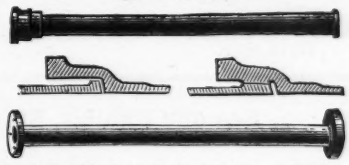

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We have now had your Retort Scurfer at these Works for over Twelve Months, and having tried several forms of de-scurfing Retorts, we have no hesitation in saying that it is by far the best Apparatus we have tried for this purpose. **Two men have several times drawn a Setting of Seven Retorts, thoroughly cleaned the same, and charged the Retorts again within 6½ hours.** As a matter of fact, it is unnecessary for a Retort to be out of use more than 40 minutes for scurfing purposes if your apparatus is used.

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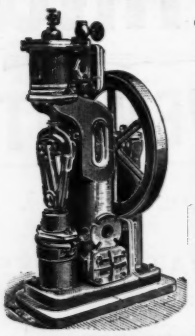


Fig. 705. "SINGLE RAM" STEAM-PUMP.

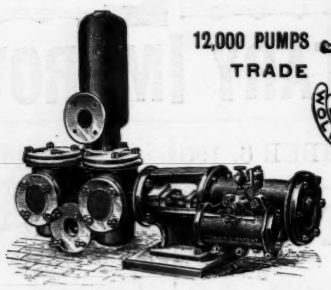


Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

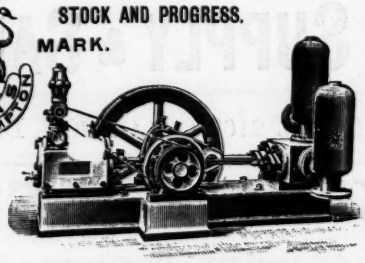
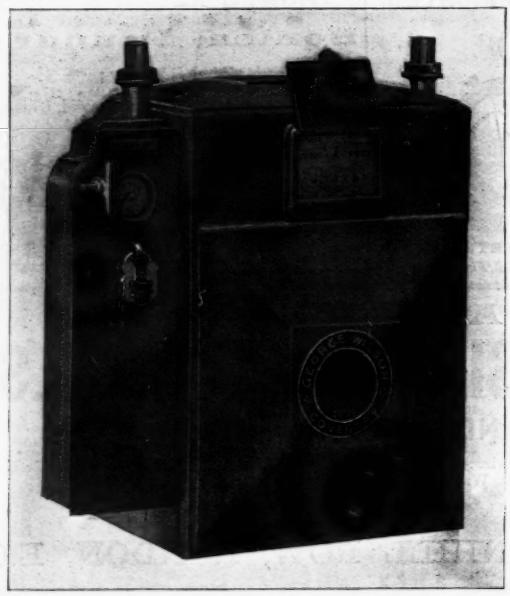


Fig. 685. "RELIABLE" STEAM-PUMP FOR TAR AND THICK FLUIDS.

Fig. 712. "DOUBLE-RAM" STEAM-PUMP.

See our Exhibit, Stands Nos. 73 and 98, at the International Gas Exhibition, Earl's Court, S.W., Nov. 19 to Dec. 17.



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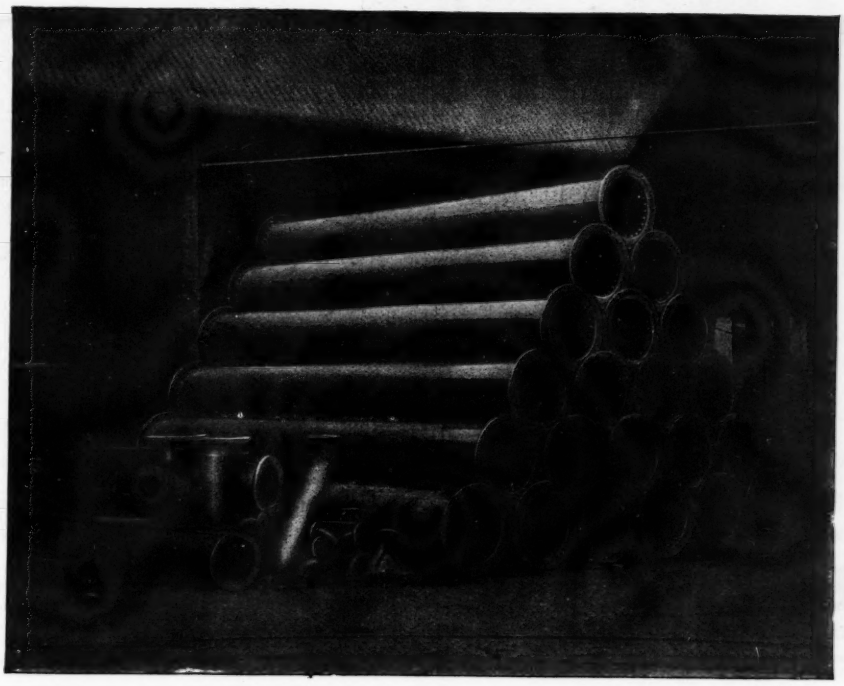

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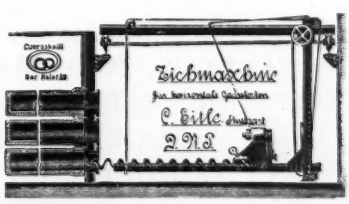

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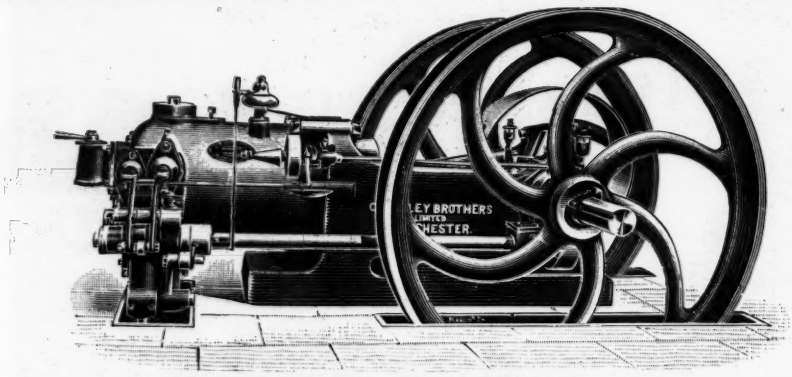

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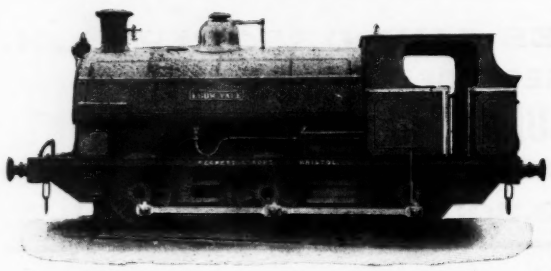

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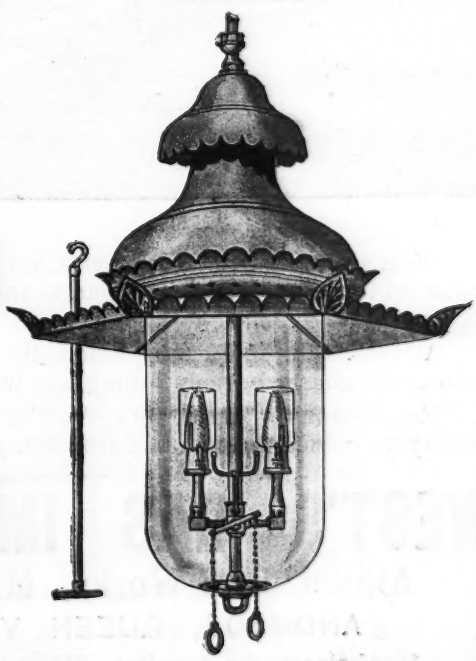

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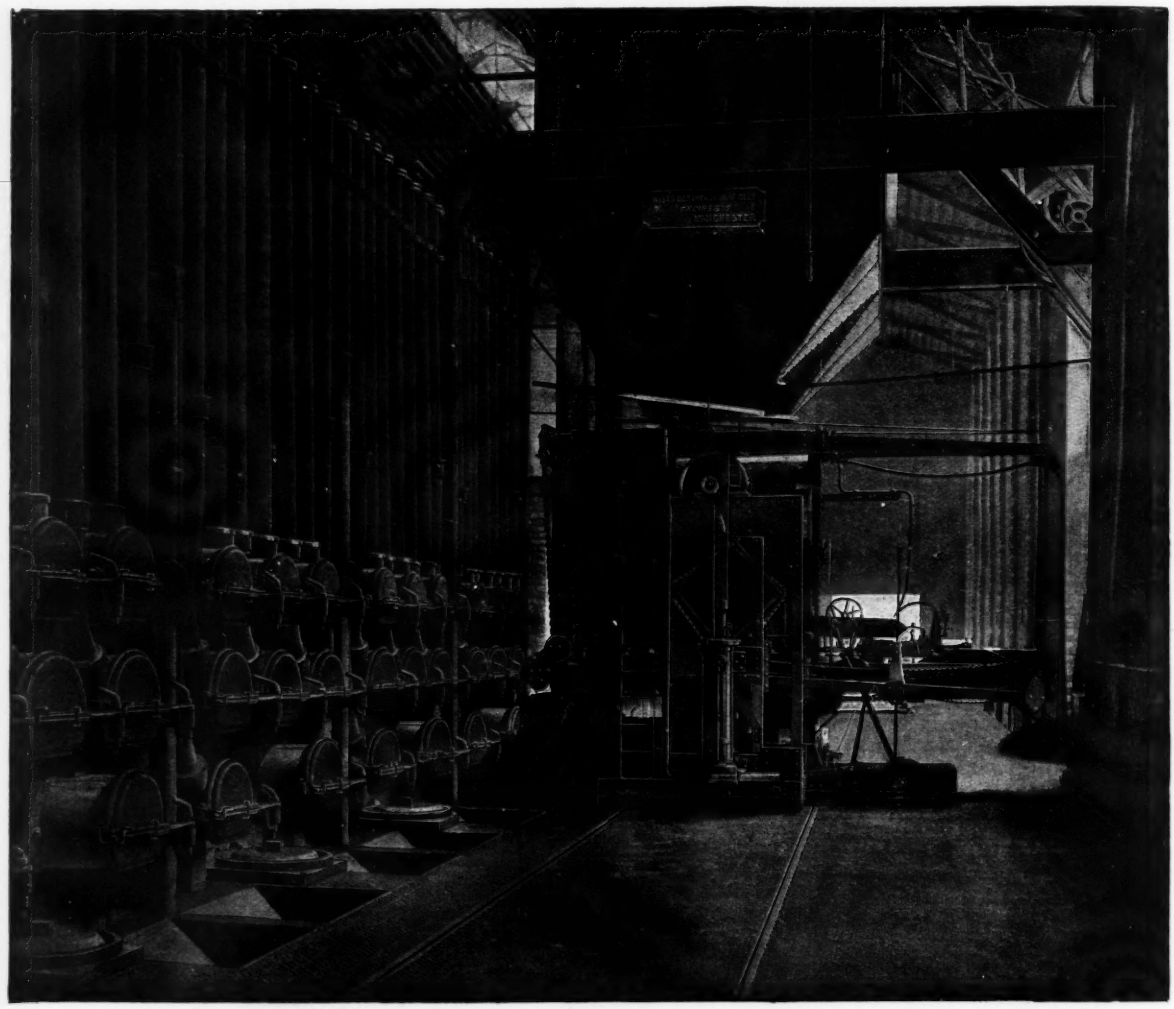

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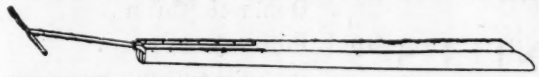

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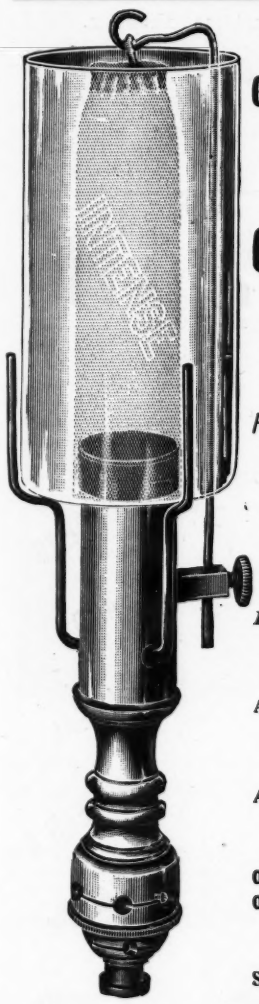

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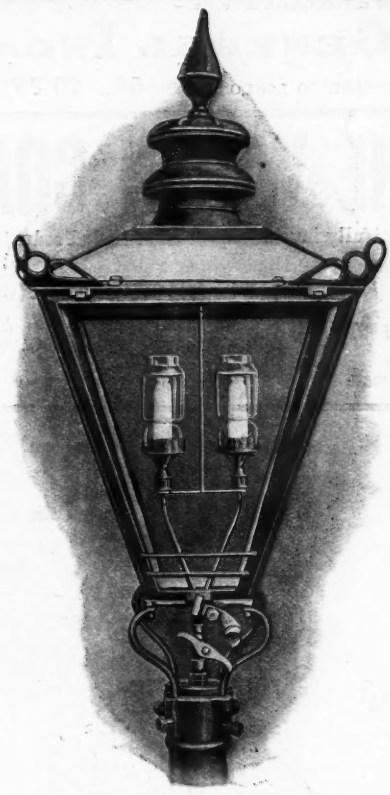

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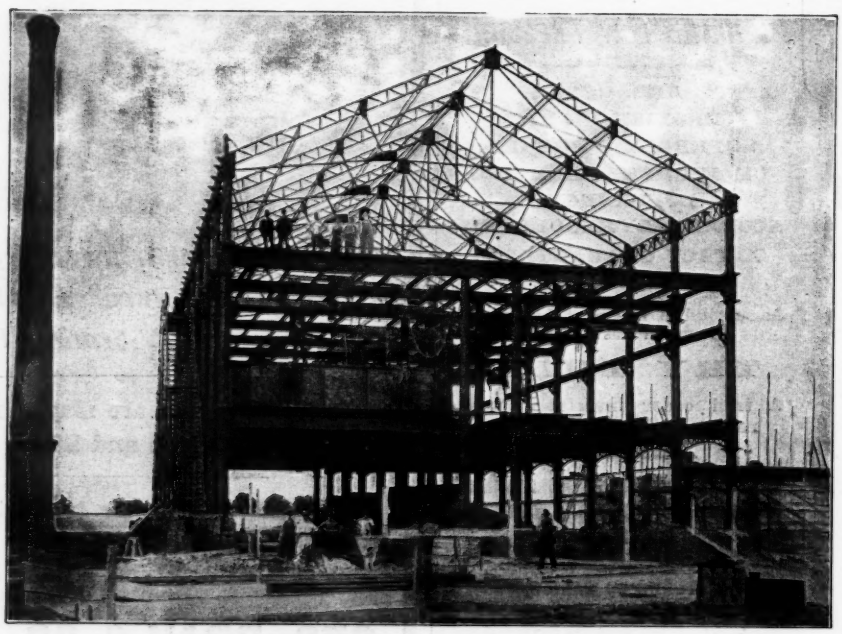

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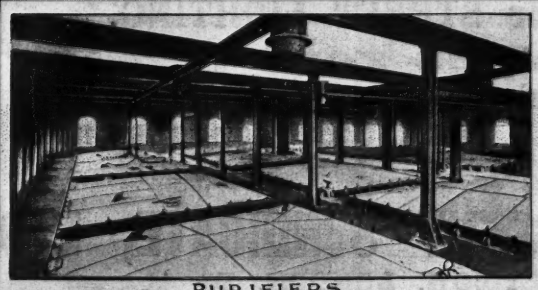
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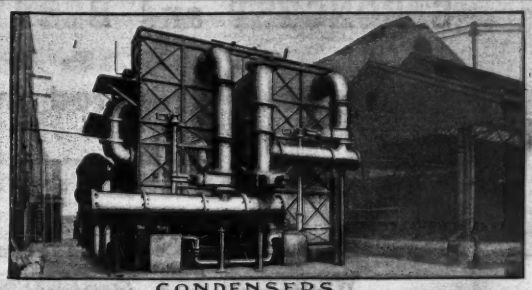
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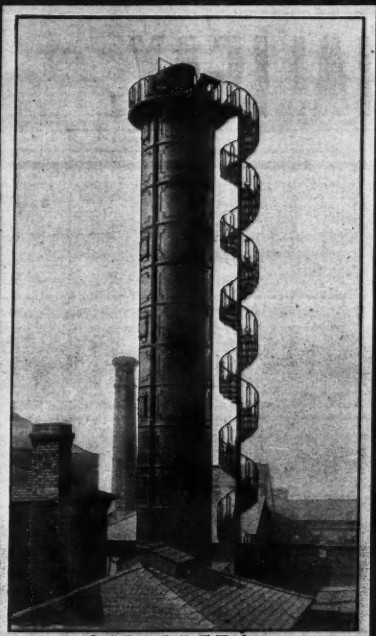
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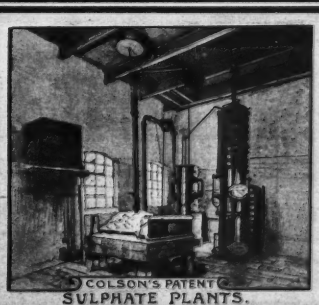
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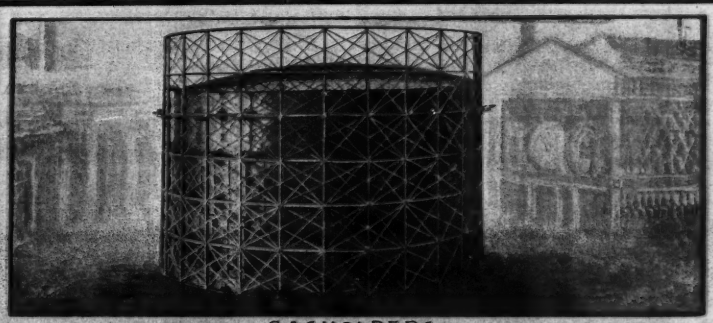
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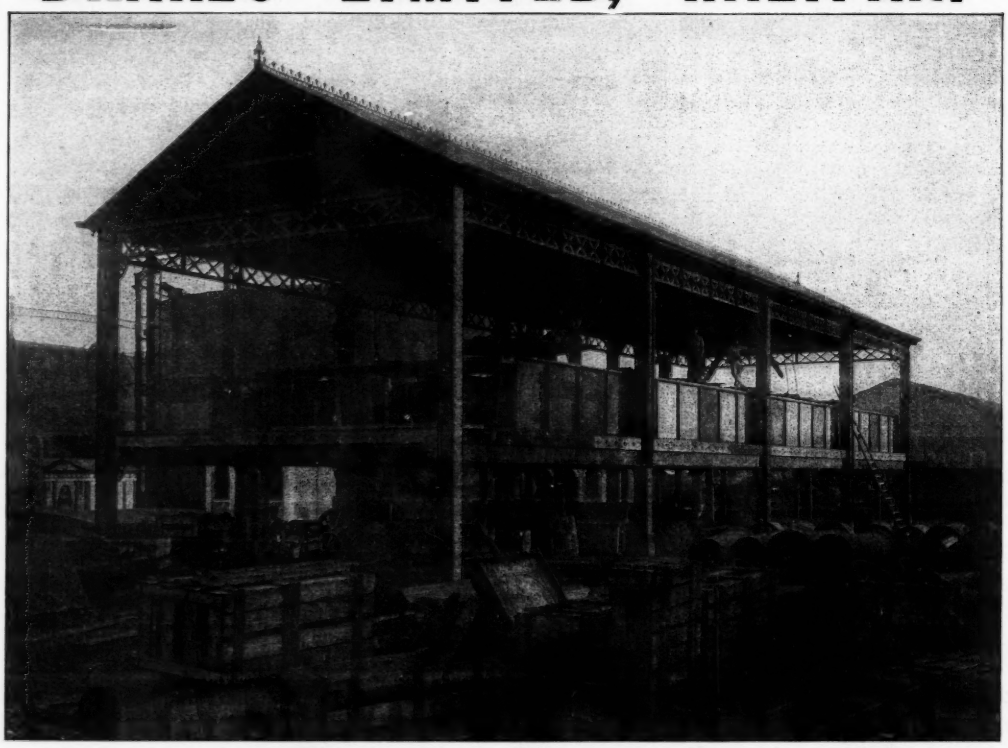

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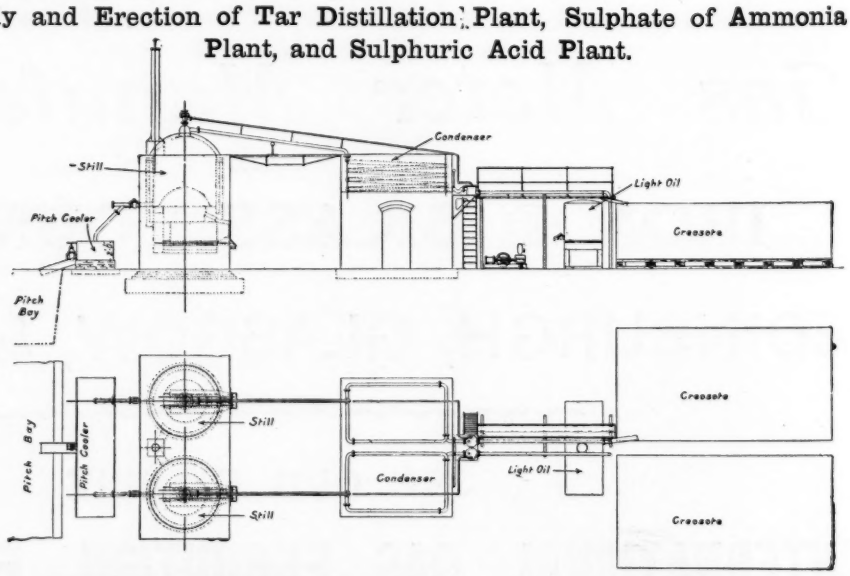

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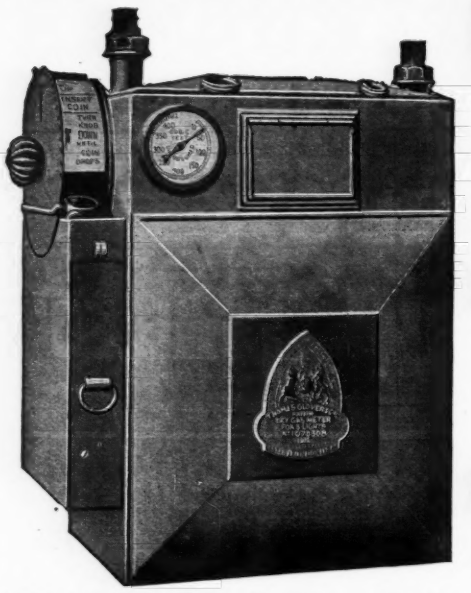

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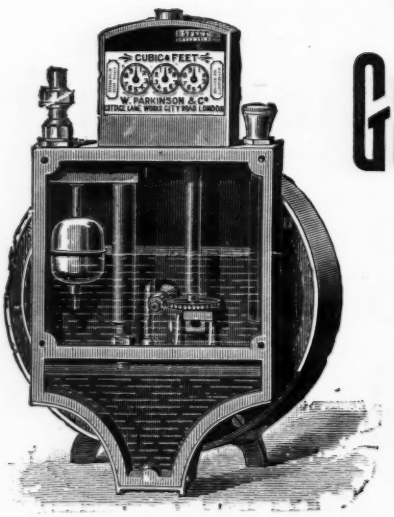

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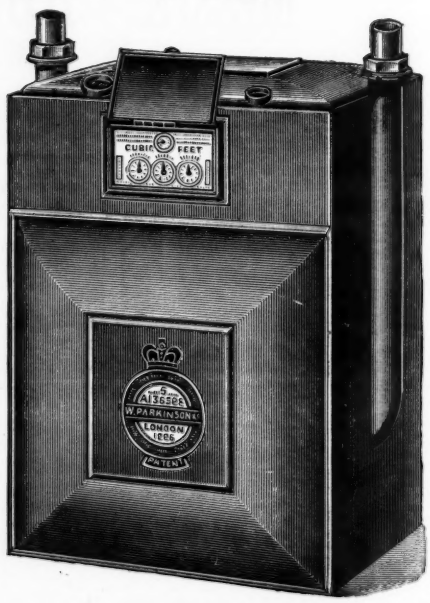

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VOL. LXXXVIII., No. 2169.—TUESDAY, DECEMBER 6, 1904.

EDITORIAL NOTES—GAS, &c.

The Gas Exhibition and its Lessons.

IN our first article on this subject, the remarkable development of the gas-engine as a source of power which has taken place since 1882 was briefly sketched. It is perhaps unnecessary to further point the moral of this development to gas undertakings; but it may be mentioned that the value of the gas consumed in that year by the 8000 gas-engines which were then in use was estimated at £200,000 per annum. At the present time, the value of ordinary lighting gas consumed for power purposes runs into millions, notwithstanding the great and general reductions in the price of gas which have since taken place. In 1882, for instance, the Gaslight and Coke Company were charging 3s. 2d., and the South Metropolitan and Commercial Gas Companies each 2s. 10d. per 1000 cubic feet for 16-candle gas; the prices to-day being 2s. 11d., 2s., and 2s. 5d. respectively—the two latter being for 14-candle gas. As indicating the great value and importance of gas-engine consumption, it may be remembered that in 1901 the late Mr. W. Foulis estimated that the Glasgow gas undertaking was supplying gas-engines amounting in the aggregate to 9000-horse power; while in the same year it was given in evidence in the South Staffordshire (Mond) Gas Bill that the consumption for gas-engine purposes in the district supplied by the Corporation of Birmingham amounted to upwards of 800 million cubic feet per annum, which is about one-seventh of the total sales. Large, however, as this proportion is, it is capable of being greatly exceeded in localities where there is experienced an exceptional demand for power—a case in point being that of a Company who are at the present time supplying about 40 per cent. of their output for power purposes. All of this is almost entirely the growth of the last ten or fifteen years. If there is not to be seen at the exhibition any new departure in gas-engine construction, at all events the capabilities of gas as a motive power will have been brought home to large numbers who, until now, have had but a vague idea in regard to them.

Probably the first cooking-stove of which there is any record is the one which was described in the "Mechanics' Magazine," Vol. XV., under date July 30, 1831, in a letter signed "J. R." This, however, was for boiling purposes only. It consisted of a cone of sheet iron, 12 in. high, 6 in. diameter at the base, and 3 in. diameter at the top, which was covered with fine wire gauze, the bottom being open. It was, in fact, an atmospheric gas-burner; the gas-pipe being carried 2 inches up the cone. Testimony to the efficiency of this apparatus was subsequently given by another contributor, who stated that two quarts of water, in a common copper tea-kettle, could be boiled with 3 cubic feet of gas, at the cost of a halfpenny; the price of gas being 12s. 6d. per 1000 cubic feet. The correspondent adds "that our gas is "of remarkable purity and brilliance, and pleases all eyes "without offending any nose." Roasting by gas is first recorded in the same publication a little later—namely, in 1833. Reference is made to this in another column, in which will be found a reproduction of the illustration of Hicks's roaster in the "Mechanics' Magazine." Mr. J. O. N. Rutter, whose name appears in the correspondence, afterwards removed to Brighton, and did excellent work as one of the pioneers of the use of gas for cooking and heating. Another, and perhaps more prominent, name in this connection is that of Mr. James Sharp, for many years Engineer to the Southampton Gas-Works. In a pamphlet which was published by him in 1851, he stated that it was then upwards of 24 years since he first introduced the application of gas to cooking, and referred to a lecture given by him in June, 1837, at the then Mechanics' Institution at Southampton, on which occasion he cooked a substantial supper, which was partaken of by a large number of the company. He further mentions, as one of the obstacles which had to be contended with in introducing this system of cooking, that cooks viewed it with doubt and dislike, as threatening to make their mistresses independent of them. Mr. Sharp, it may be mentioned, pinned his faith to "tin" as the material of which gas-cookers should be constructed; and his caution "against using any apparatus the outside of which is made "of cast or sheet iron" sounds oddly in the light of present experience and practice. At the gas exhibition of 1851, to which reference was made in the "JOURNAL" for Nov. 22, Mr. Sharp exhibited an apparatus "calculated to cook a "dinner for one hundred persons." It bore an inscription to the effect that the design was offered to the public by the inventor "not being protected by patent or registration, or "manufactured by him for sale."

Another well-known advocate of cooking and heating by gas is, happily, still with us, although no longer in active service. This is Mr. Magnus Ohren, for many years connected with the Crystal Palace District (now the South Suburban) Gas Company, of which his son, Mr. Charles M. Ohren, is now the Secretary. Mr. Ohren's pamphlet "On the Advantages of Gas for Cooking and Heating," published in or about the year 1870, was widely circulated throughout the kingdom, and did much to promote the use of gas for these purposes. Mention should also be made of the gas exhibition—the most important of its kind down to that time—which was held in the Birmingham Town Hall, under the auspices of the Gas Department of the Corporation of that city, in 1878. In a pamphlet which was written for, and distributed on that occasion, setting forth the advantages of gas cooking and heating, it was stated, on the authority of the late Mr. F. W. Hartley, that not more than 2 per cent. at most of the general body of gas consumers throughout the country at that time used it for cooking. Thus in various ways much good seed had been sown prior to the Crystal Palace exhibition of 1882–3; but it is beyond question that the latter was the starting-point of the enormous developments of which the present exhibition affords such convincing proof. As already mentioned in our columns, this exhibition was undertaken under a sense of the imperative necessity of bringing to the notice of the public the advantages of gas, not for lighting only, but also for all purposes for which heat is required. Following upon this, local exhibitions became more frequent; so that it may be said that the ball which was set rolling in 1882, has never ceased rolling since. Cooking-stoves and gas-fires became, as it were, a part of the gas manager's creed; and efforts were made in all directions to extend their use. It soon became evident that an important source of revenue had been tapped. Four years later—in 1886—Mr. Alfred Colson was able to inform the Midland Association of Gas Managers that a total of 2496 cooking-stoves had been reached in Leicester, with an aggregate gas consumption of nearly 39 million cubic feet per annum, or about 5 per cent. of the total sales. Satisfactory, however, as was the extension of this system among ordinary consumers, it was insignificant in comparison with that which has taken place in connection with the employment of prepayment meters. In Leicester alone, there are now 25,318 cooking-stoves in use with the latter, as was stated by Mr. Colson in the paper which he read last June before the Institution of Gas Engineers, on "Ten Years' Experience with Prepayment Meters." The experience of the South Metropolitan Company in this respect is equally remarkable. They have now over 200,000 cooking-stoves at rent, of which about 140,000 are in connection with prepayment meters; and the increase in the last three years is shown by the following figures:—

Year.	Stoves at Rent. Ordinary.	Prepayment.	Gas-Fires.
June 30, 1904	65,142 ..	140,070 ..	17,209
,, 1901	53,127 ..	93,482 ..	12,040
Increase in three years. .	12,015 ..	46,588 ..	5,169

It was stated in evidence before the Select Committee of the House of Commons on the Powers of Charge of the Metropolitan Gas Companies in 1899, that the difference in consumption through a slot-meter due to the addition of a cooker, averaged about 8000 feet per annum. Applying

this as a multiplier to the number of cookers here given, there is seen to be a consumption from this source alone almost equal to 10 per cent. of the total sales of the Company. It is of additional importance that much of this gas is used in daylight hours, and, consequently, tends to equalize the day and night consumption.

It is not now necessary, as it was in 1882, to make elaborate tests of gas-cookers for the purpose of determining their relative efficiency and economy of gas consumption. The conditions necessary to secure these are so well understood and recognized that a degree of excellence has been attained which it will prove difficult to surpass. The chief points to which attention has been directed during recent years are durability and handiness. The modern gas-cooker is an apparatus with which the most delicate operation of cooking can be performed with ease and celerity; and it has every part detachable, so that it can be taken to pieces for cleaning, and put together again, with a minimum of trouble. There is now no excuse for not keeping a gas-cooker clean. This is in agreeable contrast to experience with some of the early cookers, which speedily became covered with grease and dirt, and had to be frequently returned for the purpose of undergoing a thorough and expensive cleaning operation. Cooking stoves were formerly regarded—and rightly—as a fragile part of the stock of a gas undertaking; but now their position in this respect is very greatly improved.

In gas-fires, also, the present exhibition at Earl's Court shows that a marked improvement has taken place. The coal-fire grate filled with asbestos lumps, with its wastefulness of gas consumption and inefficiency, is conspicuous by its absence, and in its stead are tasteful designs, chiefly in metal, but also in Doulton ware, which can be truly said to be useful as well as ornamental, inasmuch as they assist in diffusing the heat of combustion, and thus reduce the loss which occurs wherever a flue is used. Condensing stoves—now so called—are in strong force, and in a variety of pleasing designs. They are "so called" because many of them are condensing only in name; the products of combustion not being cooled down to the temperature of the atmosphere. There is, however, no reason why this should not be done, if desired. In 1882, Mr. Charles Hunt, in the course of a paper read by him before the then Gas Institute, brought under notice some experiments he had made which showed that the products of combustion can be so cooled, and conveyed away in a descending flue. In practice, however, it has been found sufficient to effect partial cooling only. This condenses a considerable proportion of the aqueous vapour, which takes with it the sulphur compounds; leaving, practically speaking, only carbonic acid, the discharge from which, a few inches above the floor of a room, can hardly be attended with inconvenience. There is a very interesting display of means for the provision of hot water for all domestic uses, which is well deserving of the attention of architects—and, indeed, of all who are interested in domestic comfort and economy.

The attendance at the exhibition continues to be most satisfactory, and of a class to gladden the hearts of exhibitors. It greatly exceeds all expectations. A gratifying feature is the large number of visitors who are availing themselves of the free tickets of admission given by various gas undertakings to the consumers. Many of these, it may be safely assumed, are as much interested in gas cooking and heating as in gas lighting. As evidence of this, reference may be made to an application received for a ticket of admission from a young lady, on the ground that "father and mother "have taken the two tickets you sent, and I am as much "interested in gas cooking as they are." The application, it is needless to say, was at once complied with.

Private Bills for 1905.

THE Parliamentary Notices show a considerable falling off, as compared with the past year, in the number of Bills which are likely to engage attention next session. On Wednesday, which was the last day for depositing plans, 224 such deposits had been made, as against a total of 272 last year; the reduction being chiefly noticeable in the case of tramway schemes and Provisional Orders. In last week's "JOURNAL" appeared a list of notices relating to gas and water undertakings, which number 58 as regards Bills, and 19 as regards Provisional Orders, compared with 69 and 37 respectively last year; and the current issue only adds three Orders to the number. This falling off is attributable to more than one cause. Dear money is holding back local authorities; and the unsettled state of political matters has had its effect in other directions. There is a growing belief that a dissolution cannot be much longer delayed; and although, if it occurred in the middle of a session of Parliament, arrangements would doubtless be made to carry over to another session Bills that had been advanced a stage, many promoters prefer to wait until matters have become more settled. The list of notices contains very few which are of importance as regards gas supply, beyond those relating to the Metropolis, which have already been commented upon in these columns.

Notices by local authorities to apply for power to purchase gas undertakings have been given in two instances—namely, by the Otley Urban District Council, in pursuance of a purchase clause in the Act which was obtained by the Gas Company in 1901, and by the Hessle Urban District Council, who appear to have been so prompted by the notice which has been given by the Gas Company of their intention to apply for an Act of Incorporation. The Croydon Gas Company seek to acquire the undertaking of the Caterham and District Gas Company, and to extend their limits of supply; the Nottingham Corporation desire to be enabled to make bye-laws as to internal gas pipes and fittings; and the Walker and Wallsend Gas Company will apply for power to acquire additional lands on which to construct new works. It will be remembered that two years ago the latter Company were unsuccessful in their application for authority to acquire additional land adjoining their Walker works, owing to the opposition of the landowners, who are the Newcastle Corporation. It may be presumed that the Company have now met with a suitable site elsewhere for new works. In several cases application will be made by gas companies to supply electricity. There is this year an entire absence of ambitious schemes for the distribution of electricity and power gas over very large areas, such as have engaged the attention of Parliament during the last three or four sessions. Authority is, however, to be sought by the Esk Valley Power Gas Company to distribute power gas in the County of Mid-Lothian. This application is made to the Secretary for Scotland, under the Private Legislation Procedure (Scotland) Act, 1899, as is also one from the Corporation of Glasgow for leave to raise additional capital for their gas and other undertakings.

According to appearances, the coming session of Parliament promises, as regards gas matters, to be one of the dullest on record, but not, perhaps, the least useful on that account; and it may be well to remember that it is "the "unexpected which happens." There are, at any rate, questions of the very highest importance to settle in connection with the Metropolitan Gas Companies; and a session in which the seal is set to the condemnation already pronounced with regard to sulphur and other restrictions, is not likely to be described as uneventful.

Municipal Trading in Gas-Stoves and Gas-Fittings at Edinburgh.

THE agitation raised by the plumbers and ironmongers of Edinburgh and Leith over the question of the trading by the Gas Commissioners in gas stoves and fittings has ended in the manner—perhaps a little beyond it—that was to be expected by those who take a broad and disinterested view of the matter. The Gas Commissioners have very properly decided to continue the sale of stoves and fittings as being necessary to the carrying on of their business; but the Commissioners have gone further by resolving to offer the traders special terms on which they will be prepared to supply them with gas appliances for sale. While, therefore, the general question is thus finally disposed of, the point as to what will be regarded by the traders as suitable terms leaves the way open for further debate between the respective parties. The traders, however, cannot say that they have not received from the Commissioners and their Engineer (Mr. W. R. Herring) a patient and considerate hearing, and that their relative positions have not been fully taken into account. It will, however, solely depend upon the attitude of the traders now whether their relations in the matter of the sale of gas appliances and the carrying out of fitting work are to be of an amicable and mutually advantageous

character. If they do not accept the olive-branch offered them in respect of special consideration in the matter of terms, or if they attempt to drive an unreasonable bargain, then they will force the Commissioners into a position of obdurate antagonism and transfer themselves from the favourable situation as competitors which the Commissioners have tendered to them. The vote at the meeting of the Commissioners—seventeen in favour of the foregoing decision, and four preferring a recommittal of the question—is significant; and the traders should so heed it.

This question of the trading by municipal departments in goods specially pertaining to their businesses is one that must be regarded altogether apart from the general principle of municipal trading; and, even in its consideration, circumstances justify different treatment. The supply of gas stoves and fittings has become an indispensable part of a local authority's gas business. But the pursuit of that part of their business would not constitute a sufficient justification for a municipality—as the traders of Edinburgh seem to think it would be consistent to argue—entering into competition with those doing business in other necessary commodities. Parliament has over a long course of years recognized the public advantage and convenience of permitting the suppliers of gas to deal in appliances necessary to its consumption; and that Parliament has so fully conceded this is due—we might almost say—entirely to the apathy of the ironmongers and plumbers in regard to the gas-fitting business. If they had been sufficiently far-sighted, they would have afforded special facilities to the gas consumers and townsfolk generally for procuring appliances and fittings, and so developed the gas business in a manner that would have disarmed of effective argument those who were forced, for the protection of themselves and the promotion of the interests of their gas undertakings, to enter into business relations with the community outside the simple and single one of purveyors of gas. It was not until plumbers and ironmongers saw what a big thing they had lost by their indifference, that they rebelled against the activity of the local gas administrations, and sought, by the cry of public competition with private interests, to reap some of the fruits of the activity which only their own apathy had inspired.

That cry in this connection, of undue competition with private interests, is void of reason. As a matter of fact, the gas stove and fitting business as it has been cultivated is one that, in most places, local dealers never attempted to encourage, and so they never possessed the business; and therefore, in truth, the gas departments are not in competition with them in persevering, to the benefit of the community, in this line of business. It is rather the ironmongers and plumbers who are seeking to compete in a business that they have had little or no hand in building up. That the business has been of substantial benefit to both consumers and ratepayers in the majority of instances cannot be gainsaid. The supply of gas is an established and profitable business; and, through the cheapness of the commodity, there is no uncertainty about it as in the case of electric lighting, which has only in the private establishment the one practicable, but uneconomical, purpose of illumination, whereas gas has three—lighting, heating, and cooking. Consequently, the more the facilities rendered by municipal gas suppliers, the greater the consumption of gas, resulting in the lessening of the cost of production, and the price to the consumer. Instead, therefore, of trading in gas appliances and fittings being an injury to the communities, it has been of infinite advantage. It has benefited the majority at the expense of no one, seeing that the business was not formerly regarded by anyone outside as being worth any particular consideration until gas suppliers commenced to develop it; and, as a matter of fact, on the advent of electric lighting and for several years onward, the little trade that was being done in gas-fittings was relegated by shopkeepers to a secondary position. Plumbers and ironmongers, with their comparatively small and competing businesses, cannot possibly offer the same facilities to the community as a gas department, nor the same selection of modern goods, together with a like ripe experience and counsel in respect to the proper use of them.

The traders of Edinburgh will not show their wisdom if they refuse to make terms on the lines suggested by the Gas Commissioners; and we will go a step further and say that we see no reason why the shop window of every trader in gas-fittings in Edinburgh and Leith should not be partly utilized to exhibit, on terms, specimens of the gas appliances and fittings of the Commissioners. The more agents and the more advertisement, the better for the gas concern. It is largely by the energetic following of a programme of prudent means of business development that the gas undertaking has risen to its present height of prosperity; and there is no reason why that programme, without curtailing in any way the methods which have achieved success, should not be lengthened with benefit to both the Commissioners and the traders.

Naphthalene Experiences at Leicester.

When first the announcement was made that Mr. Alfred Colson had, by the washing treatment and the application of what he believes to be a newly-found solvent for naphthalene, realized an almost complete immunity from naphthalene trouble at Leicester, when similar treatment with other grades of oil had not secured for him relief, it was suggested that his friends would feel themselves at greater liberty to rejoice with him when he had confirmed those experiences by records through a complete cycle of seasons. Mr. Colson has continued the treatment of the gas from the large Aylestone Road works through the past two months, during which we have had some remarkable and widely divided variations of temperature. Some days have been bitterly cold, and others of a muggy character; some days the ground has been frost-bound, and on other days just the reverse. But whatever the climatic conditions, Mr. Colson and his staff have been permitted, through the application of the process, to pursue their duties of attending to the gas requirements of the people of Leicester unimpeded by the extraneous trouble produced by the rush of complaints of naphthalene stoppages. And perhaps of far more importance, the gas consumers have not as formerly been worried by deficient supply. The fact that there are now in the area of supply no less than 52,731 consumers adds to the importance of Mr. Colson's figures.

The tables which are published on another page bring the comparative record up to Nov. 30—that is to say, in the "Journal" for Oct. 4, the figures showing the naphthalene stoppages in the months of July, August, and September, as compared with the corresponding months of last year, were given; and now those for October and November are published. Between July and November, we have had what may be fairly regarded as the extremes of climatic change; and, notwithstanding, the experiences have proceeded with fair regularity—such trouble as there has been having been confined, with the single exception referred to below, to the area supplied from the Belgrave works, where the gas has not yet been brought under the washing treatment. But it will be remarked that since Oct. 22, the gas at the Belgrave works has been subjected to treatment not by washing, but by being passed through something approximating a mist of the solvent; and this, the figures disclose, has had a beneficial effect, but not, in Mr. Colson's opinion, to the same extent as would have been obtained by the system of washing. Another matter of interest is that the whole of the gas from the Aylestone Road works has, as a precautionary measure, been washed by the solvent since Oct. 13, though in Mr. Colson's view it is not necessary. The comparative figures are all so clear that we need not point their tale of success by comment. It will, however, be observed that only on one day during the five months does the letter "A" appear in the tables—the "A" signifying cases of trouble in the district supplied with the treated gas from Aylestone Road. On that day, —Nov. 14—there were two stoppages in the Aylestone Road gas district; but it will be remembered that the gas from the two works has free circulation in the system. Now if during five months in which we have gone through the whole range of normal seasonal temperatures, the treatment of the Aylestone Road gas has prevented all but two cases of naphthalene obstruction, then, when the gas at the other works is similarly treated, it may be expected that the "B's" in the present tables will in future ones be replaced day by day with the comforting word "none," which has in the past appeared all too infrequently. It will be noted, as something which must be placed to the credit of any process completely preventing naphthalene deposition, that at the Leicester Gas-Works they now find it possible to work the carbonizing plant at a higher temperature, and secure a larger gas yield per mouthpiece and per ton of coal.

On and from the "Co-Partnership Journal."

The December number of the "Co-Partnership Journal" of the South Metropolitan Gas Company, completes a year's existence. When the first number came to us in the freshness of its birth, it was heartily welcomed; and the nature of its contents led us to predict for it a useful career. Under the editorship of Mr. C. T. Drumgold, who has received the hearty co-operation of officers, staff, and employees generally—if not in many cases by literary contribution, in all by good wishes and support by purchase—the "Co-Partnership Journal" has prospered, and has been a monthly budget of interest and instruction. Co-Partnership binds works to works and man to man throughout the Company's service; and the mission of the little monthly is to reinforce the bond, as expanded metal in concrete work. It fulfils its purpose well. In the December number the portrait of Mr. H. C. Sims, the Company's Accountant and the Hon. Secretary of the Co-Partnership Committee, forms the frontispiece; and that honour carries with it the authorship of the first article. "Trifles" supplies the subject; and Mr. Sims illustratively shows their power. Towards the end, he says: "It is very satisfactory to note that, by far the greater portion of the Company's employees are availing themselves of the excellent opportunity the co-partnership system gives them of providing for their future; and this is emphasized by the fact that, although the bonus distributed for the past year amounted to £34,000, the value of the investments by employees for that period amounted to over £36,000, or an excess of £2000 saved over the bonus paid. Also the amount of stock allotted to employees amounts to £27,000, against £19,000 last year; and over £5000 more than last year was transferred by employees from their withdrawable accounts to the trust account for the purchase of stock." In a prominent position in this issue, too, appears the following note regarding the illness of Sir George Livesey: "The latest news respecting our Chairman is very satisfactory; for we learn that Sir George is steadily progressing towards a renewal of his former health and vigour. But this can come only after a continued period—which we sincerely trust will be of short duration—of most careful and watchful attention. This essential to complete recovery—the loving care so helpful in sickness—the patient is bountifully receiving at the hands of Lady Livesey, who during these weeks of intense anxiety has borne, bravely and unsparingly of herself, the burden in bringing about the happy condition that we now with so much pleasure report to our readers." That was good news, so far; but yesterday we were pleased to learn that Sir George is now recuperating at Eastbourne, and expects to derive much benefit from the change of air and scene.

Some Rating Statistics.

The present number of the "JOURNAL" records the fact that we have once more had the pleasure of perusing the interesting statistics regarding the rating of various towns and the charges for gas, water, and electricity which are compiled annually by Mr. James Carter, the Borough Treasurer of Preston. The task which Mr. Carter thus sets himself is an arduous one; and the fact that on the present occasion several fresh towns have been added to the list (the number of places dealt with being now no less than 88), bears testimony to his great energy. That is not all, however, for this year a third table is included, which gives the amount estimated for the current twelve months to be transferred from profitable undertakings, and the extent of the consequent reduction of the rates. The most striking thing about the statistics is, of course, the wide variation in the figures relating to different towns. On the face of it, some of the places named would seem to be much more desirable from a ratepayers' point of view than others; and this is undeniably the case to a very considerable extent. But in some instances at any rate there are doubtless circumstances which would tend to modify conclusions hastily arrived at on the subject. In the matter of high rating, East and West Ham still enjoy an unenviable reputation, with 9s. 6d. and 9s. 10d. in the pound respectively; the only town in the list to be ahead of both in this matter being Wolverhampton, with 10s. 1d. There are, however, plenty of other places where the ratepayer has to dip his hand pretty deeply into his pocket; for the return includes no less than 23 cases in which the rates amount to 8s. or more in the pound. On the other hand, Oxford and Lancaster share the distinction of being under 5s. Turning to the charges made for gas in different towns, it is found that Widnes still holds the place of honour, with the remarkable average figure of 1s. 3d. per 1000 cubic feet.

Further Facts.

The statistics above referred to, of course, relate to only a very small proportion of the area over which the British tax collector holds sway; but an excellent idea of the bearing of the question of local rates and taxes on the country generally is to be gathered from the first instalment of an article contributed by Mr. J. Holt Schooling to the "Windsor Magazine." It appears from this that the number of local spending authorities throughout England and Wales is about 28,500, made up of perhaps 300,000 individuals, who have the spending of public money to the extent of 112 million pounds per annum. Of this large sum, in the year 1900-1 (the latest period for which figures are available), no less than 26·7 per cent. was borrowed money. Local rates and national grants produced 49·8 per cent.; the revenue from water, gas, electric, and tramway undertakings, 12·5 per cent.; and the balance of 11 per cent. was derived from other sources. Mr. Schooling says that it is not satisfactory to find that so considerable a part of the yearly receipts of local spending authorities comes from loans—the amount having risen from about 13¾ million pounds in 1896-7 to nearly 30 millions in 1900-1—and he also has grave doubts as to the wisdom of the use to which so much of the money is put. After setting forth in a popular style some of the main arguments against municipal trading, he goes on to show the enormous increase that has taken place during the past quarter of a century in the receipts (including loans) of the local spending authorities in England and Wales. In 1874-5, these were £42,736,000, or £179 per 100 of the population; while by 1900-1, they had risen to £111,917,000, or equal to £345 per 100 of the population. Of these sums, the amounts received from rates alone rose from £19,199,000 in the former year, to £42,994,000 in the latter; the amount per 100 of the population having gone up from £80 in 1874-5 to £127 in 1899-1900, and per £100 of rateable value of property assessed to the poor rate from £16 12s. to £23 4s. With regard to these figures, Mr. Schooling says he has often been puzzled to see the reason why, when many more people come to live in a town, and when much more rateable property comes into existence, the local taxation should increase in the rate per pound, instead of diminishing. It does do so, however; and many people besides ourselves will be interested to see whether, in the concluding portion of his article, the author is able to hold out any hope that a brighter day will dawn for what he calls that "patient beast," the British taxpayer.

A Call to Arms.

The figures just quoted are amply sufficient to prove (if any proof is needed) the existence of a grave condition of affairs; but still stronger evidence is to be found in the fact that the London ratepayers (who are, to say the least, not easily stirred to action) are becoming seriously alarmed. So much so, indeed, that the Islington Ratepayers' Association a few days ago arranged a conference of similar bodies to consider the question of the "increasing and intolerable rates which municipal Inner and Outer London is called upon to pay;" the result being an agreement to form a Central Committee, with the object of doing what is possible to curb the spending proclivities of the London County Council. An interesting item in the proceedings was the reading of a letter from the Mayor of Islington, Mr. A. M. Torrance, in the course of which he said: "I do ask everyone to study closely the present position, whether it be the County Council, the Borough Council, or other authorities. The gross increase of rating during the past ten years is alarming. There appears to be no idea of regulation or co-ordination of expenditure; and the result with the individual ratepayers is crushing and intolerable. I therefore welcome any combined effort which will bring the present serious situation to the notice of the representatives." It is difficult to be sanguine as to the results likely to be achieved by the Ratepayers' Associations in connection with present members of the County Council; but the step that has been taken is a significant one, and when next the elections are held the combination may succeed in making its power felt.

The Fall of the Nernst Lamp.

The electrical world has its parallel of the Welsbach capital, reduction case; but fortunately the amount of lost capital involved is not so heavy, though it is of serious magnitude. There was a great deal of trumpeting when the Nernst electric lamp was first introduced to the world; and so great was the noise, that the timid among gas shareholders were almost again persuaded that through the new lamp, electricity was going to undermine the security in which they had reposed their faith. The Nernst lamp was the thing of the time; and people with money fluttered round, and subscribed freely in the belief of a profitable future. That their confidence was misplaced was seen last Tuesday as the position of the concern was unfolded before Mr. Justice Swinfen Eady on the petition for the reduction of capital. In the opinion of an expert accountant, the paid-up capital of the Company is unrepresented by available assets by at least £230,000! That the noisy boastings at the introduction of the lamp, the price paid for the patents, and the sanguine expectations were all unwarranted, is a point that is finally disposed of by this calculation and the proceedings before the Court. Without ridding themselves of the large incubus of capital, the Company could never have hoped to see a dividend; and whatever dividend they can even now earn will never recoup them the losses of the past. That is a safe prediction. It appears that all the money that has been spent on the effort to establish the Company in this country as a lamp manufacturing concern and on experimental work has been irretrievably thrown away, as it has to be confessed that the lamps cannot be manufactured here; and so the Company have to obtain them now from a German firm, who, it is said, possess "some secret process by which the lamps appear to be made marketable." The Company are therefore nothing more now than sellers of the lamps made by the German firm. Still the British royalties are claimed to be most valuable. While, however, this claim is made on the one hand, it is said on the other that the lamp has shown itself to be unsuitable on account of its unreliable behaviour, especially with varying voltages; and, unless the lamps can be further improved, it is questioned whether the earning power of the Company will exceed something between £4000 and £5000 a year. However, £90,000 is now considered the correct figure at which to value the total share capital; and it was to this amount that reduction was sought and allowed. In the light of this, the statements made when the Company was floated must supply rather unpleasant reminiscences for others besides the shareholders. The over-capitalization of concerns floated to run simple patented articles, exclusive proprietary rights in which have only a limited life, is one of the disgraces of our times.

Coal Supply in Russia.

"In Russian Darkness" was the title of an article that appeared in the "JOURNAL" in November last year, in which the condition of the Moscow Gas-Works was described, and some idea given of the backwardness generally of gas supply in Russia, from observations made by Mr. J. T. Westcott. We are reminded of that article by a study of some figures relating to the coal industry of Russia published in a report by the Belgian Consul at Moscow. The coal production it is seen is increasing; last year the total yield from South Russia, Poland, Ural, the Moscow district, and the Caucasus being 1,069,450,000 pouds (29,707,000 tons), as against 953,512,000 pouds (26,486,000 tons) in 1902. The figures for 1902 were, however, substantially lower than for 1901; but for that year they were not so high as those quoted above for 1903. Another table gives figures showing the destination of the coal produced in the Donetz Basin during the past two years; and it was a line in this statement that attracted attention, and called to mind the experiences of Mr. Westcott. The total amount of coal sent from the Donetz Basin in 1903 amounted to 517,951,000 pouds; this being more than half the total mentioned above. But of that quantity, only 4,282,000 pouds were consigned to gas-works. The year before was even worse; for of 452,883,000 pouds produced in the Donetz Basin, the moderate amount of 2,770,000 pouds were delivered to gas-works. These figures are significant of backwardness in artificial illumination; but, comparing the two years, and finding an increased use for gas-works purposes of 1,512,000 pouds of coal raised in the Donetz Basin, the facetious man might say that in Russia things were looking up in the gas line. But a poud is only equal to 36·11 lbs.

AN INSTITUTION OF GAS-WORKS CONTRACTORS AND MANUFACTURERS.

A Suggestion for Consideration.

THE important position that the gas industry has attained in the country has been demonstrated time and again by numerous statistics; and it is now receiving at Earl's Court a vivid illustration of ripe development to a point from which it is setting out in the fullness of vigour to win fresh laurels in all fields in which it has made way through beneficent service to mankind. That service has through the years of existence, and especially so through those constituting the last quarter of a century, been moulded and directed by that safest and surest of all sciences in industrial progress—the science of economics. The service to the community has not been limited to the provision of cheap light, fuel, and power, but it has extended to the provision of a remarkable opportunity for the profitable and secure investment of capital, and to the provision of a lucrative, and constant for the most part, employment of labour of many grades—so many and so well known to our special readers that they need not be enumerated.

It is, however, usual, in giving statistics referring to the gas industry, to confine them to the capital actually employed in the manufacture and distribution of gas, and in considering its labour to number only the workers engaged in such operations. This does not give in reality any fair measure of the gas industry as it should be broadly viewed. The gas industry so regarded is not an independent entity. It is surrounded on all sides by other industries on which it is itself dependent—industries which feed and contribute to its support, and which industries derive a benefit from their service in direct correspondence with the benefit realized by the gas industry. Within that outer ring of industries, there comes a section of the country's manufacturers and contractors, without whom what is generally known as the gas industry cannot exist, and who, on the other hand, have their very being in the existence of the gas industry. These are the specialists in gas manufacturing and distributing plant and in the appliances through and by which the gas made is utilized, and through and by which gas has been rendered what may be truly termed a necessity to the community. The work of those specialists in plant and appliance production has, we venture to think, had as much to do with the progress of the gas industry as the work of those who are specialists purely in the production of gas and in the administration of the business of gas supply. In other words, by their work, by their economical and serviceable productions, they have assisted in creating the demand for gas which has built up the gas industry. Therefore, we prefer to regard the gas industry as embracing those in whose works are centred many of the roots of the big growth over which we are at the present time so greatly rejoicing. If the capital and labour engaged in these great contributory concerns could be computed, the figures generally taken as representing the strength of the gas industry would receive a substantial addition.

In the foregoing, we have claimed certain things on behalf of gas manufacturers and contractors. First, we have claimed for them identity with the gas industry—a right to be regarded as an integrant of the industry. Secondly, that they have taken an incalculable part in the development of the industry; and there is the ground of their right. Thirdly, that gas manufacturers and suppliers and gas plant and appliance manufacturers have an interdependence that no amount of argument or disregard can destroy. Fourthly, that respect is due to them as large employers of capital, skill, and labour. Consideration of these points may win for them all tacit consent; we would fain see open recognition. But sufficient for the argument is the tacit consent. Admitting that the contractors and manufacturers of the gas industry have taken an active part in making the pace in the progress of the industry, the further admission must succeed that they have done this through inventive skill (in which engineering, science, and practical application are all intermingled), a keen conception of the requirements of the present and future, an eager willingness and desire to meet those requirements in the best possible way to their own profit and the profit of the gas industry, with the whole enveloped in business acumen and capacity. "There is however, a pronounced line of demarcation between us and the gas industry as represented by those engaged in the manufacture and supply of gas, and that line has been ruled not by us. We feel and we recognize it." That is the plaint that has fallen on our ears on many occasions from many individuals. The line, however, is not so pronounced as those feel who lament its existence. "We are," it is also said, "regarded as inferior beings by those over the other side of the line." It is our desire at the present time to suppress that feeling; and it will be the desire of all on "the other side of the line," if such exists, to suppress it too. Verily, it would have been a bad thing for the gas industry if there had been on the one side of the supposed line all the best inventive faculty, the perspicacity, and the business capacity, with nothing but the inferior on the other. But is there—look at the matter broadly in the face—less of all the essentials to the building up of a strong industry on the gas contractors and manufacturers' side of the hypothetical line than on the other? Not a whit less. In their ranks are men of whom all are proud; and

from their engineering shops and works have come men who have made their mark in the realm of gas manufacture and supply. The overlapping of the sections of the gas industry is extensive and secure; and, being so, no line of such a character as has been so frequently suggested can be said to exist in fact.

Now we come to the point; and it may be said that we are treading on dangerous ground. We refuse, in view of what has already been stated, to recognize the danger. The great exhibition at Earl's Court has been impressive on many points; but not the least of them has been the hearty, and not only hearty but generous, manner in which the gas contractors and manufacturers have come forward to illustrate the might of the gas industry. Could a more substantial proof of a community of interest between gas plant contractors and appliance manufacturers and gas makers and suppliers be needed than this exhibition? We think not. In the increasing demand for gas, in all plans for cultivating that increase, the former have their prosperity with the latter. While the exhibition has demonstrated all this, and left no room for contradiction, there is another thing that has been impressed with equal force; and it is that the gas-works contractors and appliance manufacturers of this country intermingled in interest with, yet having a distinct sphere in, the gas industry are in an utter state of disorganization. They are floating units necessary to a body, possessing all the constituent parts necessary to an active, useful body, and yet without a body. In other words, they have no representative, central organization which can speak and act with authority, and form mutually beneficial alliances with kindred institutions, and no means of cultivating, through technical and social ways, the honourable aspirations of most men to have communion with fellows having identical interests. Hands may be held up in pious horror, and the ugly word "ring" may be whispered. The idea has nothing of the kind within it; and the slightest intimation of such a thing would alienate the sympathies of several of the leading manufacturers, and put an immediate end to any operations detrimental to the gas industry as a whole. Competition is too great in the gas industry to ever permit the continuance of any such thing. Rings where there is great competition are bound to be ephemeral. That is a point that can be dismissed without raising the slightest anxiety, and more especially seeing that protection against such a thing could be specifically legislated for in the rules of the new Institution.

Let us seriously consider the matter; and first of all emphasize the point as to unity of interests among the contractors and manufacturers, and yet a disunited existence, by reference to the present exhibition. There we have unity of interests typified in all its strength; but, in realizing that illustration, what an amount of labour has been involved through chaos and disorganization—through the contracting and manufacturing section of the industry consisting of a great number of separate units without bond of any kind. The Institution of Gas Engineers said in effect: "We will have an exhibition;" and forthwith they had to go to every gas plant and appliance manufacturer and contractor to obtain his attachment to the project. The whole thing, though involving so much trouble and expense, might have been a failure. How much easier, how much better, how much more dignified would it have been if the contractors and manufacturers had been in corporate existence, with a Council of representative men at their head, to whom the Council of the Institution of Gas Engineers could have gone and said, "Will you co-operate with us in organizing an exhibition?" and then have proceeded to act jointly in the matter throughout.

It is, as we have said, a natural thing for men to organize for the advancement not only of themselves but of the profession, industry, or line of commerce with which they are associated. In every professional, industrial, and commercial walk of life it is so. The gas profession have their national organization, and with considerable benefit their district societies. Secretaries and accountants have theirs. The same with all other professions. Look where one will, too, among the industries—other than in the contracting and manufacturing section of the gas industry—and it is found that they have their technical and commercial and representative organizations. The old question need not be discussed here as to why the contractors and manufacturers should not be part and parcel of the Institution of Gas Engineers. The interests of the members of that organization are manifold, in many of which interests the contractors and manufacturers have no concern. The interests of contractors and manufacturers are, as a matter of fact, largely of a specialized order; and therefore about the bulk of the matters which engage the gas profession, many of them have not the remotest care. There is, however, overhanging all division of interest, the one great common interest in the prosperity and advancement of the industry. There is no conflict of interests on that point; and the contractors and manufacturers have proved it, and their fidelity to the industry, by this present exhibition. We have heard a great deal about affiliation and unity of late in the gas industry; and why should there not be unity in its contracting and manufacturing section?

Now what would be the advantages of such an organization? That is a question that will be better answered after several minds have been brought to bear on the subject. But a few points occur off-hand. In the first place, at the present time, the contractors and manufacturers are not—and cannot be because of the want of an organization of standing which can be approached—taken so fully into the counsels of the gas industry as they might otherwise be. We can quite imagine such a thing as this happening—the interchange between the Councils of the respective Institutions of suggestions for discussion at the annual meetings; and the invitation from one Council to the other to select members from their respective bodies to attend meetings when subjects upon which those members were specially qualified and competent to speak were being introduced for consideration. The Institution of Gas Engineers, in short, would be the better able to act in collaboration and conference with gas contractors and manufacturers as an organized body than they can now do with individual firms and companies. And, of course, the same holds good on the other side. Their Institution would give to gas contractors and manufacturers a status which they do not at present possess. Annual meetings could be held at which the President of the Institution could deal with commercial questions and problems of interest to the general body of the members. Subjects of both common and sectional interest could be introduced for discussion through the medium of papers or orally. There is the social side, too. We spoke only last week in the "JOURNAL" about the good fellowship that exists among the representatives of the exhibitors at Earl's Court. Only this last week, again, at the exhibition the chief of an exhibiting firm said that he had met one of the principals of a competing firm for the first time that day; and he was pleased that he had had that opportunity of making his acquaintance. He added: "If he succeeds in getting a contract in future for which I am competing, I shall be better pleased than I may have been in the past, now that I know what a good sort of fellow he is." These two men had been competing for years; and they had never met until this exhibition. Why was this? Simply because there had not been the opportunity. The meeting and introduction had altered their feeling one towards the other; and an Institution would tend to promote this friendly spirit and comradeship. Opportunities would also be given for the exchange of courtesies and evidences of friendship between one section of the gas industry and the other, which could be done and accepted through an organized body, where the suggestion would be objectionable from individual firms. It would, however, be an indispensable condition, in order to ensure the necessary status, that the Council of the new Institution should be composed of principals or directors, representative of the whole range of contractors and manufacturers.

The suggestion is open for discussion. It is put forward as a means of dispelling the feeling which now so generally exists that gas-works contractors and manufacturers are of the gas industry, and yet have no recognized position in it. An Institution of their own, with a President and Council drawn as suggested above from principals and directors, would give them the honourable standing they desire, and to which they are entitled. The suggestion comes at an opportune time. There is in existence a Committee of Exhibitors at Earl's Court, with Mr. C. Clare as their Chairman. We cannot do better, having given the question this start, than suggest that Mr. Clare should call a meeting of that Committee for the private discussion of this matter, and then communicate the result and resolutions for publication in our columns. If the matter does not come to anything, we shall at least have the satisfaction of having put forward, in crude form it may be, but with good intent, a proposal which we believe is the one solution of a difficult problem—that solution is the bringing into existence of a corporate body, consisting of gas-works contractors and manufacturers whose aims and interests would be to unitedly, as well as individually, do their part in aiding in the progress of the industry of which they constitute an important part, and in encouraging and maintaining a good tone in the commercial life of that industry.

Action of Sulphuretted Hydrogen on Copper in Cyanide Solutions.—The fact that copper is not precipitated by sulphuretted hydrogen from potassium cyanide solution has been ascribed to the formation of the complex salts $K_6Cu_2(CN)_8$ and $K_2Cu_2(CN)_4$ respectively. Mr. F. P. Treadwell and Herr C. von Grisewald ("Zeit. anorg. Chemi.," Vol. XXXVIII., 1904) find, however, that while concentrated solutions of the former salt are not precipitated by sulphuretted hydrogen, solutions of the latter salt are. It was also found that an ammoniacal solution of copper containing enough potassium cyanide (KCN) for the formation of the salt $K_3(NH_4)Cu_2(CN)_6$ is not precipitated by sulphuretted hydrogen. The authors conclude that the non-precipitation of copper from solutions of potassium cyanide is due to the formation of the complexions $Cu_2(CN)_3$ and probably also $Cu_2(CN)_6$.

Gilbert Little and Sons, Limited.—Under this title, Mr. Gilbert Little, of automatic conveyor and elevator fame, has founded a new purely speciality Company. The situation of the new works—with the London and North-Western Railway right in front of the workshops, the canal running along the end of the erecting-shops, with an arm of the canal passing through the fitting, the erecting, and machine shops, all within a stone-throw of the Mond Gas-Works—is an ideal one for an engineering establishment engaged on repetition specialities. In the new works, it is calculated, a saving of at least 50 per cent. will be effected in power and fuel, besides rendering the expense of boilers and chimneys unnecessary, and dispensing with the labour of handling coal and ashes, and the nuisance of a tip for ashes. Mr. Little, we understand, is still the chief proprietor in the New Conveyor Company.

NOTES FROM EARL'S COURT.

THE more the Exhibition is inspected—whether it be in the machinery or lighting and heating sections—the more one feels that it could not have been organized at a more appropriate time. It does good sometimes to pause in life's rush to "take stock." Gas men have all been too busy of late years in developing business and in applying new and improving methods to gas production, sale, and use to take a comprehensive survey of what has been done and what is being done, and to make an estimate of the prospects for the future with the means at disposal. To sit down in home or office and satisfactorily "take stock" where so much is involved, is a matter of some difficulty; but a visit to the exhibition makes the exercise a comparatively easy one. There it is all illustrated, and can be seen and examined; and a very good statement could be drawn up from what is witnessed, by any gas man, as to the position now occupied and as to the outlook. It will be perceived by those taking stock through the aid of the great display—no one can fail to so perceive—that economy is the bed-rock on which the gas industry is building. Economy is writ large everywhere in the exhibition. Economical production and use, wisdom has shown, make for strength in the gas industry just as in many others; and the lesson having been so well learnt, with such marvellous results, no one will dream of retracing his steps, but all will continue to go forward aiming for greater things on the lines of the successful past. In the midst of the success, the exhibition will be looked upon in the future as a historical landmark.

Administrative Interest.

It is marked as a matter for particular gratification that those engaged in the administration of gas affairs other than permanent officials are taking a very serious interest in the exhibition; and this is as things should be, and is a good portent. Chairmen, directors, and committeemen have, during the past week especially, been plentiful among the visitors. The exhibition is a fine educative opportunity for them; and there could be no better means than this of impressing and interesting them in the progress of the methods of the industry. Administrators of gas undertakings are not unknown who habitually harden themselves against all proposals of their officials to spend a little money in publishing by demonstration the abilities of the best and up-to-date appliances, and who often look askance at schemes involving an additional expenditure of capital that their officers are convinced will prove profitable. A visit to Earl's Court must convict many of their error in judgment. There are others who have a tendency in the opposite direction; and it has been a matter of interest to learn how some of these have, on seeing new articles of high efficiency in performance, been anxious to have samples for local experiment and advertisement. However, in all cases, inspection by administrators must broaden their views and knowledge, to the benefit of the undertakings they direct, and undoubtedly to the assistance of their engineers and managers.

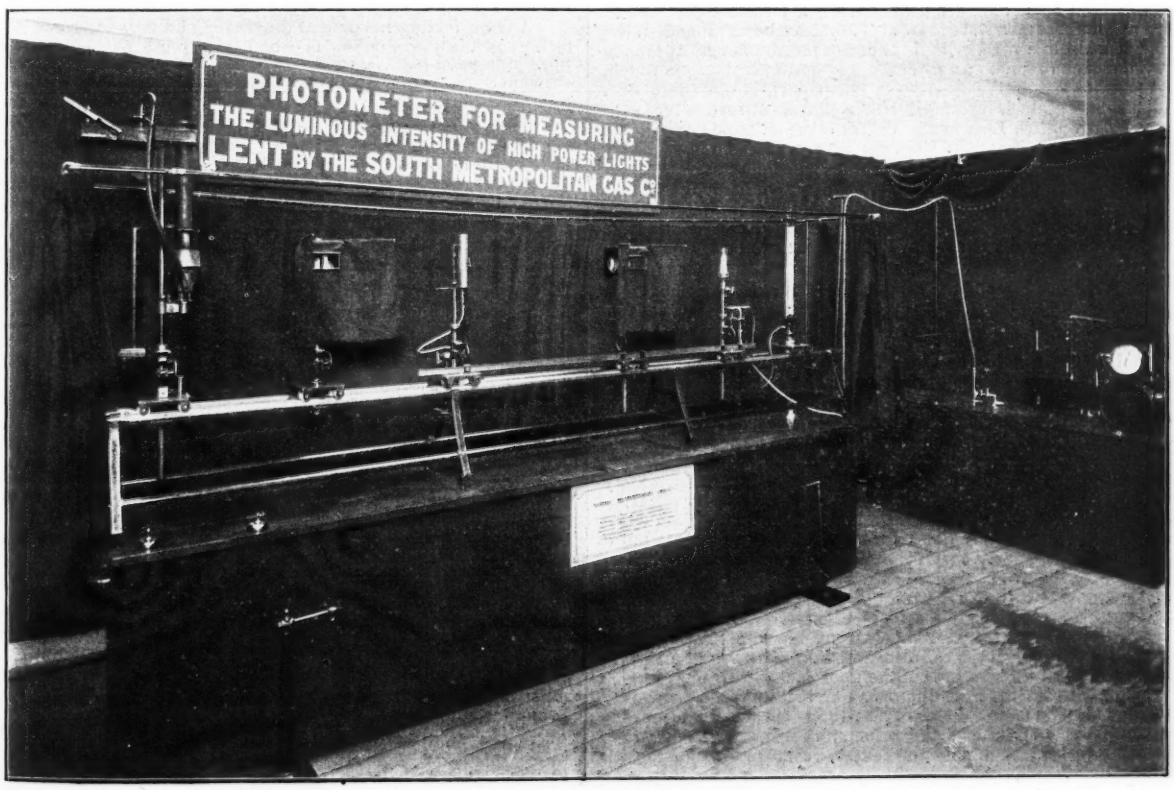
Among the larger Corporation Gas Committees who were at Earl's Court last week was that of Manchester. They visited it on Tuesday; and there was no part of the exhibition that did not come under their inspection. Alderman Gibson (the Chairman) was accompanied by quite a large following of his colleagues—including Aldermen Jennison, Bowes, Birkbeck, Rushworth, and Councillors Ashton, Cowan, Hassall, Kay, Lowry, Marsden, Ruddin, Smith, and Watmough. With the party were the Deputy Superintendent (Mr. F. A. Price) and the Chief Engineer (Mr. J. G. Newbigging). The company were delighted with all they saw; and no doubt returned to Manchester with a reinforced assurance that the renewed activity of their friends in the Electricity Department need not occasion them much concern, though it cannot be ignored.

The Gas Committee of the Leicester Corporation have decided to contribute 25 guineas to the Advisory Committee's fund for meeting expenses, and have also approved a suggestion Mr. Colson laid before them that the members of his staff, at his discretion, and some of the leading fitters in the Gas Department, should visit the exhibition, as their duties would allow, at the expense of the undertaking.

The South Metropolitan Gas Company's Photometer for Incandescent Burners and Mantles.

In the reference to the loan collection last week, mention was made of the photometer exhibited by the South Metropolitan Gas Company for testing incandescent and other high-power burners, as introduced by Mr. Charles Carpenter and Mr. J. W. Helps to the International Photometrical Committee at Zurich in June, 1903. The question of testing incandescent burners and mantles has been revived in these columns of late; and, as it is one in which all gas engineers and managers are very closely concerned, the photometer referred to above will have for them an especial interest—this being the first time that there has been an opportunity for all and sundry to examine the construction of the actual instrument. By the kindness of Mr. Carpenter, we are able today to publish a photographic view of the photometer as it is fitted up at Earl's Court, close by the Advisory Committee's office in the Ducal Hall

It will be within the recollection of readers that, when Messrs. Carpenter and Helps produced the photometer for the consideration of the Photometrical Committee, they presented a descriptive paper, which was published in the "JOURNAL" at the time. The photometer as exhibited, it should be stated, is identical in principle with the one described in that joint communication;



but, for convenience, the various standards and parts have been mounted on one long bar, *instead of two smaller ones placed at an angle.* With the photograph before them, readers may desire to refresh their memories as to the construction and method of using this simple form of apparatus, which has been in use now for a considerable time by the South Metropolitan Gas Company for the particular purpose of testing incandescent burners and mantles. We therefore reproduce the following portions of the paper:—

The standard lamp is not compared directly with the light to be tested, but serves to fix a predetermined value to a secondary standard of the same quality and colour as the light under examination, and with which therefore it can in turn be readily compared. The secondary standard is produced by surrounding a suitable incandescent burner with an opaque screen, in which is cut a vertical narrow slot. The slot is provided with a sliding-shutter actuated by a fine screw, by means of which its length, and therefore the amount of light emitted, can be varied at will. Two divided scale-bars are used, having a terminal common to both at the secondary standard. They may be arranged in the same straight line with, or their opposite terminals may approach towards, each other, so as to make any convenient angle which, in the photometer illustrated (in the paper), is an acute one. The primary scale is provided with a moveable screen-box containing a reversible Leeson star disc or other suitable device; the scale being divided equally from the centre towards the primary and secondary standards. The secondary standard rotates about the junction of the two scale-bars, and is provided with an index pointer, by means of which it can be set so as to occupy the same relative position to either. On the secondary bar is mounted a reversible bunsen disc-box, and at the other terminal the light to be tested.

The procedure of operating is as follows: After the lamp and burners have been alight for a sufficiently long period to become normal, the operator proceeds to regulate the light emitted by the slot of the secondary standard. This is effected by making a series of comparisons with the standard lamp, varying the slot opening until the readings on the scale of the pointer of the disc-box do not vary sensibly from zero. The secondary standard will thus be giving an illuminating power either of a Carcel or 10 candles, whichever lamp may be used. It is then rotated so that the pointer-index coincides with the secondary scale-bar, and direct observations of the burner under observation may then be proceeded with. It has been found that, when once set, the standard remains constant for several hours; but it is, of course, extremely easy to continue its verification by comparison with the primary standard right through the experiment. It is found that this can be done with great accuracy, owing to the lights being of equal intensity though differing in colour. The authors have tested incandescent burners varying from 50 candles to nearly 1200 candles, and with satisfactory and concordant results. The details of the photometer can, of course, be varied to suit different conditions. For instance, the secondary disc-box may be fixed on the bar at the same distance from the incandescent standard as the primary disc-box. In such case the light to be tested must, of course, be moved in making the observations.

A Popular Exhibit—The Suite of Furnished Rooms.

The suite of rooms illustrated in our "Notes" to-day comprises dining-room, drawing-room, two bed-rooms, kitchen, and a combination dining and billiard room. Messrs. Ewart and Son's bath-room, which adjoins the suite, completes the rooms required for a Model Flat. The Gaslight and Coke Company (to whom we are indebted for the photographs) have lighted the rooms with a variety of up-to-date and artistic fittings—some with inverted burners; some with ordinary incandescent burners worked by electric distance-lighters (which have attracted much attention); and others with the "candle-light" burner, which is very much favoured by ladies for drawing-room illumination. The drawing-room in this instance, it will be observed, is lighted entirely from the walls; thereby avoiding all interference with the room space, and providing a soft and well-diffused light. A handsome standard lamp, possessing all the advantages, and none of the drawbacks, of the oil-lamp which is so often to be seen in drawing-rooms, is another attractive feature in this room.

A novel feature in some of the dining and drawing room gas-fittings is the introduction of wood panels and blocks to match the furniture of the rooms.

The rooms are heated either by gas-fires built up in ordinary fire-grates, or by elegant gas-stoves fitted in tiled-recess fire-places. We direct the attention of architects particularly to the advantage of these tiled recesses over the fire-places usually fixed throughout a house. Where the former are adopted, gas-stoves stand back properly under the mantelpiece (note this especially in the second bedroom); whereas gas-stoves fixed in front of an existing grate always have something of a make-shift appearance about them.

The kitchen shows every kind of gas apparatus useful to the cook. A large range fitted in a tiled recess is the prominent feature; and here again is a wrinkle for the architect and builder. Why pay for and build-in a large coal-range, which may rarely be used, when, by leaving a tiled recess of proper dimensions, the tenant can be left to provide a coal or gas range as he may desire? Much space is wasted in most kitchens through the gas-stove having to be put in front of the kitchener, or in some other part of the kitchen not meant for it. It has not even yet dawned on the architect that no kitchen is complete without a gas-stove, and that a place should therefore be provided for it. Then there are a geyser and a boiler to provide hot-water; a large griller; and a coffee-roaster—all, of course, heated by gas. Other geysers fitted in the bath-room complete the occupier's arrangements for hot-water supply. An ordinary small coal fire, or a small gas-stove would be needed to keep the kitchen warm in winter. In summer, with all the heat and smell of cooking going up the chimney, the kitchen would be one of the most comfortable rooms in the house.

It should be mentioned that the suite of rooms have been furnished throughout (very artistically) by Messrs. Fallows and Co., of 25, Curtain Road, with the exception of the billiard-dining room, which was fitted up by Messrs. Cox and Yeman, of 184, Brompton Road.

The Gaslight and Coke Company have every reason to be pleased with the attention which their model flat has attracted. It demonstrates admirably the most suitable and effective methods

of lighting and heating such rooms. Whoever was responsible for the work deserves the heartiest congratulations. Together with the Company's chemical shop and workmen's dwelling, the suite of rooms is certainly one of the most popular exhibits at Earl's Court.

From the Continent.

To-day a number of gas engineers from France, Germany, and Holland are honouring the British gas profession and the gas industry by visiting the exhibition. This will be the great event of the week. The visitors will be the guests of the President and Council of the Institution of Gas Engineers, who will receive them in the Lecture Hall just before one o'clock. Luncheon will be served immediately afterwards, and then a tour made of the exhibition. In the evening, there is to be a dinner at the Hotel Cecil.

Suggested Exhibition for the North.

In the notes last week, it was intimated—and the intimation was based on expressions of views by exhibitors—that, in all probability, many years will elapse before there will be another exhibition on a scale which will equal the present one. Several exhibitors are definite on that point, although they have every reason to be gratified with the present one, as a means of prominently bringing their goods—large and small—before the gas industry and the public. The question, however, has been raised (and one or two of the exhibitors who have mentioned the matter do not see any great hindrance to the proposal), as to whether part of the exhibition could not be taken northwards to some great centre—say, to Manchester. Others think differently, and would prefer a postponement to next October. The suggestion first publicly emanated from Mr. W. Whatmough, at the meeting of the Manchester Institution last Saturday week. He put it to the President and Committee as worthy of serious consideration, whether, all the expense and work of organization having been incurred, it would not be feasible for the Manchester Institution to arrange for the lighting and heating section being taken to that city. In Mr. Whatmough's opinion, it would have a good influence in the North. Of course, it would be next to impossible to get the exhibition, or even a section in its entirety, repeated in Manchester; and while parts of it would make an effective display, it would not be so impressive as the magnificent show at Earl's Court, and so there would not be the same attractiveness about it. At the same time, the idea is not an impracticable one; and therefore, if it can be arranged, and it is thought that it will be advantageous to the gas industry in the North, any encouragement and assistance that we can render will be forthcoming. But let this be quite clear to all readers of this paragraph: The proposal is simply in the air, it has not shaped itself, and it may never do so; and, even if it does, it will not be the International Gas Exhibition that now exists at Earl's Court. Therefore the suggestion must not be allowed to affect any arrangement on the part of anyone connected with the gas industry to visit London before Dec. 17. We take it that, even if representative parts of the exhibition get to Manchester, they will only be sufficient to arouse the interest of the public, and not of the far-reaching importance of the present valuable display.

Since the foregoing was written, we learn that a large firm of makers of meters, stoves, engines, and high-pressure lighting apparatus (whose stands first intercept the visitor on entering the Ducal Hall) would be quite prepared to join in an exhibition in Manchester or Glasgow next autumn.

Also a Prolongation of the Present One.

A third suggestion is that the present exhibition, owing to its marvellous success, should be prolonged for a fortnight. We do not think the exhibitors are generally favourable to the idea; and greatly as the exhibition has been patronized, there are doubts as to whether it would continue to have an attractive influence sufficient to warrant the exhibitors continuing there for an additional fortnight. From the Provinces everybody who has any intention of visiting the exhibition will have now made arrangements to do so before Dec. 17; and as a matter of fact gas managers from a distance could not afford to be away during the heavy demand of Christmas time. Generally there would be an attenuated interest in the exhibition with Christmas entertainment about. In addition to this, it would be unfair to the attendants to keep them on duty for the fortnight extending over the Christmas holidays; and it would be inconvenient to the exhibitors to have the exhibition on hand just at the close of the half year.

Special Visits of Gas Engineers and Managers.

There was a constant stream of gas engineers and managers from the different district organizations during the past week. Before the members of the North British Association left London on Tuesday, about a dozen gas managers arrived from Ireland, including Mr. Richmond (Kilkenny), Mr. Enright (Tralee), Mr. Paterson (Queenstown), Mr. Lennon (Dungarvan), Mr. Tyndall (Mallow), Mr. Airth (Dundalk), and others. They paid a visit to the exhibition together on Tuesday afternoon, and again on Wednesday evening, when a party of twelve, with Mr. R. Bruce Anderson, dined in the grill-room. Individually several of them visited the exhibition at other times on Wednesday and Thursday —all leaving for home on Thursday night. They were generally most favourably impressed with what they saw; and naturally, being mostly managers of small works, they devoted attention rather to the simpler appliances for using gas than to the high-pressure systems and mechanical appliances for manufacture. They seemed unanimous in considering they were amply repaid for the discomfort of their long journey, and felt that what they had seen would soon enable them to recoup to their companies the cost of their expenses.

The members of the North of England Gas Managers' Association are visiting the exhibition mostly at their individual convenience; but on Wednesday and Thursday last, there were probably not less than thirty from the North of England, including the directors of some of the companies in the district. The President of the Association (Mr. E. E. J. Anderson) was present at Earl's Court on Thursday, and the Hon. Secretary and Treasurer (Mr. Herbert Lees) spent two full days there. There was no formal meeting of the Association; but many of the members went very

conscientiously through the exhibition with a view of inspecting all there was to be seen. Another contingent from the Association's territory will be in town this week. The exhibition has been taken up most enthusiastically in the district, by both companies and gas-supplying authorities who are sending up numbers of their staffs—in the latter case including Public Lighting Superintendents. Mr. Lees thinks that this might well be done by others. Certainly it would be to the advantage of the local authorities to know what can be done in modern public lighting.

Several members of the Eastern Counties Gas Managers' Association were in evidence on Thursday and Friday; but, in their case too, though the days had been named for the visit for convenience, there were no formal arrangements or meetings.

About 40 members took part in the visit of the London and Southern District Junior Gas Association on Saturday. Prior to the inspection, a meeting was held in the Café Chantant Room; and it was accompanied by a very pleasing incident. The President (Mr. W. Grafton), addressing the members, said it had been considered that they should take advantage of the present special occasion by presenting the Honorary Secretary with a gift, to which the members had subscribed, as a slight recognition of his services to the Association. Mr. R. H. Brown, one of the Vice-Presidents, made the presentation, which consisted of a very handsome set of gold studs and links. The speeches and enthusiasm of the members showed the popularity of Mr. Scarth, and the esteem he has earned. The members then had tea together; and afterwards broke up into parties, and made a tour of the exhibition. Great interest was shown in the excellent displays, and the exhibition was unanimously pronounced a great success. It was only regretted that the time allowed by one evening did not permit of full attention being given to the various exhibits, although the time was employed to the best advantage under the excellent conductorship of Mr. H. Rothwell. The members were struck by the trouble taken by the various firms in demonstrating their specialities, particularly in the engineering section. In the lighting and heating section, a point which attracted considerable notice was that many of the exhibitors are now furnishing a long-felt want in supplying means of obtaining hot water during the process of cooking by gas. The Imperial Stove Company, it was observed, utilize the waste heat from the oven; the hot-water tank being fitted into an ordinary canopy attached to the cooker. There is consequently no unsightly tank to be seen. The party were struck by Messrs. Wright and Butler's solution of the difficulty in the "Paragon" cooker. The name was voted very appropriate; for not only does the range supply the house with hot water, but the arrangement can also be used as an ordinary gas-fire. Messrs. Wilsons and Mathieson explained that they overcame the difficulty by employing a small circulating boiler attached to the existing hot-water supply-pipes, without disconnecting them from the kitchener. This was only one of the many items of interest which the members specially inquired into.

Junior Institution of Engineers.

We understand that arrangements are now in hand for a visit of the Institution to the exhibition next Saturday, on the invitation of their Chairman (Mr. Saml. Cutler, jun.). The membership of the Institution has now risen to the grand total of 800 and it is probable that there will be no less than 150 members in the visiting party. There are comparatively few of the members directly associated with the gas industry; the remainder representing all branches of the engineering and allied professions. If, however, proper arrangements are made to conduct the party round, explaining the various exhibits, we feel sure that much knowledge concerning gas and its uses will be conveyed to them, which will be an advantage to the gas industry.

The Ventilation of the Exhibition.

If it has not already been, something might surely be, done—even if it is only by removing a few panes of glass in the roof—to relieve the temperature in the Ducal Hall. The stand managers and attendants have been complaining bitterly of the high temperature, and were petitioning the Organizing Managers on the subject last week. What with all the exhibitors wanting to show the great heating virtues of their stoves and the lighting merits of numerous lamps, the place has been insufferably hot. Gas is a good ventilating agent when there are means of egress above—not without.

Results of the Quick Cookery Competitions.

We mentioned last week the conditions attaching to the quick cookery competitions; and gave the breakfast and lunch menus upon which the competitors had to work. Comment was made, too, on the remarkably smart performances witnessed. But the figures then given were a long way beyond what was the record for the week. There is no doubt that the same menus being repeated day after day assisted the competitors to "speed-up" their operations, and so shorten the time occupied. The record time for the week ending Nov. 26 for the luncheon (see the menu published last week) was 19½ minutes; and the winners were (1) Miss Wooder, (2) Miss Lennard, (3) Miss Murphy. The record time for the breakfast was 12 minutes; and the successful competitors were (1) Miss Murphy, (2) Miss Wooder, (3) Mrs. Hitching. On the Saturday, there was a children's breakfast competition; and the girls showed a surprising skill in the preparation of the viands and in handling the gas-stoves—demonstrating the beneficial results that are attending the teaching of cookery among young girls. They have opportunities nowadays that their mothers did not possess; and it is the gas-stove that has given them these opportunities. The training which they are receiving will qualify them to earn their own living, and they will be the better housewives for the skill which they are acquiring while in their teens. However, in the competition, Louise Litcher, aged 15, from the Baroness Burdett-Coutts School, came out top in the successes. The second in position was B. Galman, who is only 13 years old, and a scholar at the Wesleyan High School for Girls; and the third was B. Lofts, age 14 years, of St. John's School, Westminster. The record time was 9¾ minutes.

The menus in the competitions last week were on Monday, Wednesday, and Friday—Breakfast: Tea; grilled fish; Scotch egg (hard-boiled egg coated with sausage meat or ham mixture

and fried); two slices toast; three slices bread and butter. On Tuesday, Thursday, and Saturday—Luncheon: Fillet of plaice, fried; steak and potato chips; chocolate pudding with custard (powder); macaroni frits (boiled pieces of macaroni in savoury batter, fried and dusted with cheese). The winners of prizes in the breakfast competition were: (1) Miss Lennard, (2) Mrs. Hayward, and (3) Mrs. Wilson. The last-named lady, though an "amateur," showed marked smartness and skill. The record time for the week was $7\frac{1}{4}$ minutes. The winners in the luncheon competition were: (1) Mrs. Hitchins, (2) Mrs. Smedley, and (3) Miss Gale; and the record time for the week was $9\frac{3}{4}$ minutes. In the children's competition, the winners were: (1) F. Foulsham, aged 12, time $9\frac{1}{4}$ minutes; (2) F. Wort, aged 13, 13 minutes; (3) Ida Campbell, aged 13, $13\frac{1}{4}$ minutes; (4) F. Hockett, aged 14, and E. Pritchard, aged 13, both $12\frac{1}{4}$ minutes. It will be noticed that the youngest girl won the first prize, and did the work in three minutes less than the second best in regard to time. The competition was, of course, of a simple character—representing a workman's breakfast of fried rasher of bacon, poached egg, two pieces of toast, three slices of bread and butter, and tea. There was great merriment over the struggle of the young ladies on Saturday evening.

Cookery Lessons for Girls.

Why should not gas suppliers take the hint from the children's cookery competitions, and the remarks made in the foregoing paragraph, and institute free cookery classes for school girls in their districts where there is nothing of the kind in existence. The girls have an influence at home; and in the future the majority of them will have homes of their own. No girl who has been so trained by a patient and proficient teacher would be content to be without a gas-cooker. The girls might be reached where their mothers cannot be; and the advantage would be mutual—to those providing the classes and to those taught. For such a purpose, one teacher might be appointed by several neighbouring gas companies or corporation gas departments.

The Cookery Lectures.

At the time the prizes were being presented (at the close of the first week) to the successful rivals in the quick-cookery competitions, there was a little graceful incident which must be recorded. Miss Helen Edden, to whom had been confided the cookery lectures and demonstrations the first week, and who had made herself very popular, was present; and the Chairman of the Exhibition Advisory Committee, Mr. James W. Helps, presented her with an exquisite basket of flowers—pink roses and lilies of the valley with trailing ferns and smilax. The gift was accompanied by some very flattering words from Mr. Helps.

The cookery lectures, which with the quick cookery competitions are under the superintendence of Mrs. Sutcliffe, continued during last week to be much appreciated—not only by the ladies, but by a very fair number of the sterner sex, whose gastronomical knowledge does not, as a rule, penetrate so far as the operatious of the kitchen. During the week, Miss A. Atkinson, whose name is very familiar in this branch of the gas industry's educational efforts, lectured with excellent effect on the art of cooking, and demonstrated the many virtues of the gas-stove in the cultivation and practice of that art. She also had the pleasure of receiving a basket of beautiful flowers from Mr. Helps.

Saturday Evening.

The exhibition is undoubtedly one of the surprises of London for the time; and last Saturday evening was a surprise to the organizers. The place was packed almost to suffocation not by gas men and their fair relatives but by the general public. So dense, in fact, was the crowd that the management had to have additional police on duty to prevent congestion in the Queen's Palace Annexe, and to keep the people moving in one direction. As the interested throng passed down the Annexe into the Queen's Palace, and (after exhausting the exhibits there) passed out again, they had to be directed by way of the grounds back into the Ducal Hall to obviate opposing streams. A peep into the demonstration hall while Mr. Helps was presenting the cookery prizes showed that it was filled by an enthusiastic audience—not only sitting but standing room being fully occupied. It was, however, a most orderly and respectable London crowd. A correspondent's view coincides with our own—"the whole thing is booming enormously."

Gas Literature for the Public.

Among the literature that is being distributed by the exhibitors, nothing more choice is to be found than two pamphlets that have been prepared by the Gaslight and Coke Company; and we should advise gas engineers who happen to be at Earl's Court to possess themselves of a copy of each as patterns up to which to work. One is entitled "The Best and Cheapest Light;" and the compiler has put into it thirteen very fine photographic illustrations as samples of installations of incandescent gas lighting that the Company have made in their district—including some of the many cases in which gas has superseded the electric light, "and demonstrated the fact, which all business men should note, that incandescent gas-burners give a better and cheaper light than electricity." The second pamphlet constitutes an illustrated catalogue of the gas-heating stoves lent on hire by the Company; but the gas-fire pages are interlarded with information as to what the Company are prepared to do for consumers, important facts for every householder and business man to bear in mind, remarks as to the advantages of cooking and heating by gas, and some plain observations on "the cheapest power." The whole style of the pamphlets—reading matter, illustrations, and printing—is of a character which speaks of careful preparation with the view to attract attention.

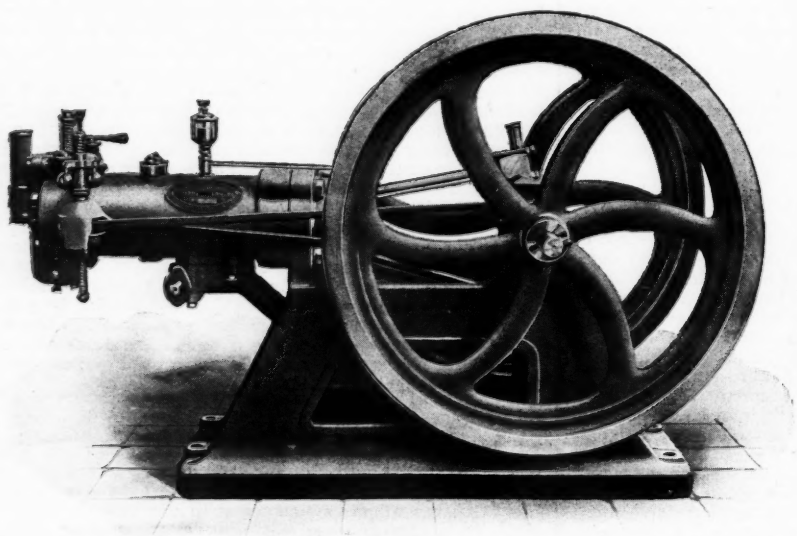
Iron Alloy for Meters.

The account which we gave of the stand of Messrs. Thomas Glover and Co., Limited, on the 22nd ult. was brief; and two of their exhibits were left over for independent reference. In the first place, our attention was called to one of these special exhibits by a photograph of the beautiful and historic church of Boston, Lincs. Though churches and gas-meters have little relationship excepting in a comparatively small way, there is

pushed into the corner of the frame the photograph of a meter. That meter is one of many testimonials to the value of a form of meter-case construction to which we have to draw attention. The meter which has been photographed was made by Messrs. Thomas Glover and Co., and was installed at Boston in 1859—that is 45 years ago; and it has never been touched since. The longevity of the meter notwithstanding, its case remains unimpaired; and the firm ascribe this to the iron alloy material of which it is composed, and of which they are the original makers—it being now some fifty years since they adopted this preservative method of construction. The material is of Manchester or tin plate coated with the iron alloy; and it is the latter that gives to the casings a double assurance against deterioration. The process leaves no pin-holes where corrosion or gases can commence their destructive action; and the outside of the casings, too, is fully protected from inimical atmospheric influences. On the firm's stand there is a 150-light meter, with an iron alloy casing; and an inspection of it will disclose more than further description here. Messrs. T. Glover and Co., are, it is understood, the only makers of this material; and they state that they feel justified in claiming that it is the best material on the market for such purposes as meter casings.

The "Gothic" Gas-Engines.

At their extensive works at Edmonton, Messrs. Thomas Glover and Co. are now making gas and oil engines, to which they have given their old trade name of "Gothic;" and examples of their gas-engines form the second exhibit to which we have to specially direct attention. These engines are made under Melhuish's patent; and on the stand can be seen working a duplex set of 4-horse power gas-engines of this type driving the compressor plant for the Sale and Onslow high-pressure lighting. They are fitted up just like an electric lighting installation, with the compressors (instead of dynamos) side by side with the engines; but the important difference is that, from the combination of engine and compressor, a greater amount of illumination for the expenditure is being obtained than could possibly be secured at the same cost by an electric lighting set. It will be noticed that the engines are working with charming noiselessness and smoothness; and an examination of a sectional drawing of the engine will show that the working parts have been reduced to the minimum. The special feature about the engine, however, is that an impulse is obtained every revolution. Perhaps the action will be understood by the following general explanations: Supposing an explosion takes place, the piston travels outwards, and the exhaust gas passes out of the side of the cylinder to the exhaust-box. Then as the piston travels a little farther, it uncovers a port in the bottom of the cylinder which leads through the condenser to the front end. Now the front part of the piston has been travelling outwards; and as there is no other inlet into the front end, a vacuum is created there. The foul charge is sucked out when the piston allows communication between the working cylinder and the front end; and at the same time a new charge is drawn into the working cylinder so as to satisfy the vacuum. On the back stroke, the piston compresses the new charge, and fires it with a hot-tube in the ordinary manner; while the foul charge that was sucked into the front end is forced out, but cannot get into the working cylinder inasmuch as the piston has closed the port. Consequently, it comes out through a small non-return valve into the same exhaust—thus completing the cycle in one revolution. This applies to the original type of engine. In the new forms, the principle remains the same; but the firm have modified it somewhat, with the result that they are now able to do without any valve open to the pressure—the only valve on the engine being the gas-inlet one, and that being only there for the purpose of governing. The engine is extremely simple in construction; and it has several pleasing points.

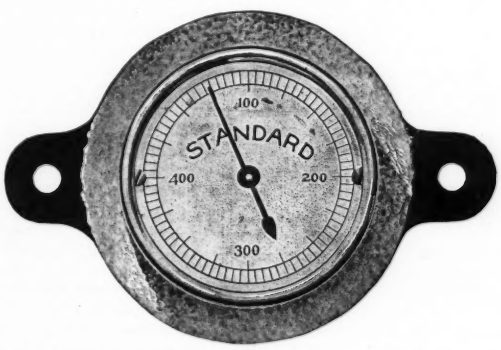


THE "GOTHIC" GAS-ENGINE

The oil-engine manufactured by Messrs. Glover and Co. is built much on the same lines; the differences being only in certain of the minor details.

Gas-Oven Heat-Indicators.

In the doors of some of the gas-ovens shown by the Davis Gas-Stove Company, and we believe by one or two other firms, are noticed some neat little heat-indicators, named the "Standard," and which have—Mr. Adolph Riekmann, the European Agent, tells us—the merit, in combination with cheapness, of being absolutely reliable. The illustration shows one of the forms. In the making of these thermometers or indicators, advantage is taken of the



THE "STANDARD" HEAT-INDICATOR FOR GAS-OVENS.

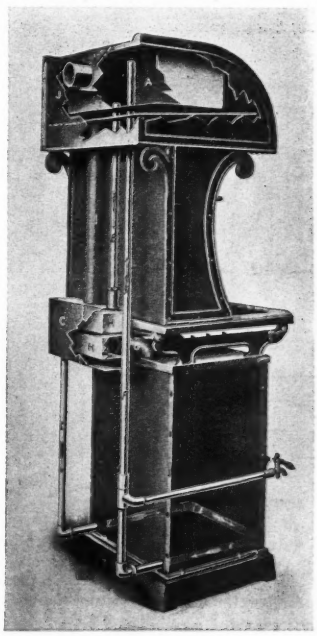
well-known principle of differential expansion by heat in a metallic strip made of two or more metals, and the consequent distortion of the strip or lamina; and when this is said, there is little to add, as the arrangement is very simple. The thermometer is fitted with an asbestos ring, which serves the twofold purpose of preventing draught gaining admission to the stove, and protecting the metal back-plate of the instrument from intense heat. The assortment of the instruments is varied and comprehensive—the manufacturers having produced not less than nine different styles; and the prices being low, they do not appreciably add to the cost of applying to ovens such a convenient means of ascertaining and regulating the temperature. It is stated, too, that they will last as long as the stove or range to which they are fixed.

From the Dukeries.

Since the stand of the Wigan Coal and Iron Company, Limited, was first fitted up, the coal exhibits have been supplemented by a specimen load of large and splendid coal—top hards and brights—from the Company's new Manton Colliery in the Dukeries.

A Hot-Water Circulating Attachment.

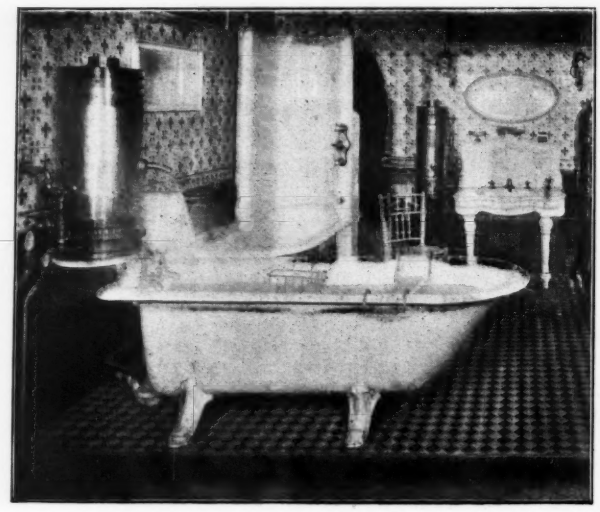
Among the belated information regarding exhibits which we find of sufficient interest to notice is a special cooker, with hot-water circulating arrangement attached, made by the Flavel Range and Imperial Gas-Stoves, Limited. The illustration is a back view of the cooker, with the hot-water arrangement. A brief description will explain the action. The water in the circulating cistern A descends through the pipe B into the copper flue chamber C. It then circulates round the flues H, flows from the bottom corner on the opposite side, down the pipe D, round the copper pipes E (situated above the oven burners), and back up through the pipe F again into the circulating cistern A. The escaping heat from the oven, after being utilized for roasting purposes, passes by way of the flue G through the flues H (formed internally in the copper flue-box C), and, travelling up the flue-pipe I into the hood J, mingles with the waste heat from the boiling-burners of the hot-plate (which is collected in the hood); and then has to thoroughly circulate round the cistern A before finally passing into the flue. By this arrangement the water is first warmed before flowing into the oven, thus preventing condensation or cooling down of the oven; and, in a short time, a good and continuous supply of hot water is obtained without any increase in the amount of gas consumed. The advantage of being able to secure a copious supply of hot water without additional expense during the time that cooking by a gas-range is proceeding, is so well recognized that this invention will be closely scrutinized. The main point on which inquiry will be made is the claim that the temperature of the oven is not affected.



BACK VIEW OF COOKER AND HOT-WATER ARRANGEMENTS.

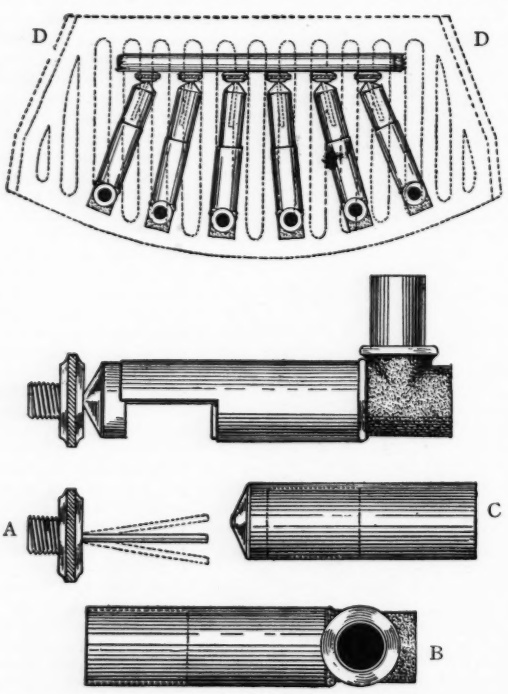
A Telescopic Adjustable Fire-Burner.

A reference of a couple of lines was all we were able to make to Messrs. Tilley Bros.' new patent telescopic adjustable gas-fire burners when noticing their exhibits in the Exhibition Number issued on the 22nd ult. The burner is now available for fuller description. Its special object is to enable an ordinary grate to



BATH-ROOM FITTED WITH GAS APPARATUS BY MESSRS. EWART AND SON.

be readily adapted for gas, without having to send a man to first take measurements. The illustrations show that the burner is divided into three parts. There is the gas-jet A; and the air-chamber is in two separate portions. Of the latter, the outer tube B, having the flame nozzle attached to it, slides upon the inner tube C. The following description shows the manner in which the fire is formed. A number of burners, from four to eight, is adopted to suit the size of the grate, or intensity of fire required; and the jets A are screwed into the feed-bar D, to either end of which the gas supply may be brought. Next the inner tubes C are inserted and the gas-jets A bent till they point in the direction of the fronts



TILLEY'S PATENT GAS-FIRE BURNERS.

of the selected openings in the grate bottom through which the gas nozzles are to project. The nozzles should be brought through the openings so that their tops are level with its upper surface, and be kept about an inch back from the inside face of the front bars. Then place the outer tubes B over the inner tubes. The burners can then be lengthened or shortened as required by sliding the outer tubes upon the inner ones. A special fire-brick (so shaped that it will deflect the heat into the room by radiation) is then placed about 3 inches back from the grate-bars and built in with fire-clay. The fire is then finished by packing with fuel. The arrangement is simple; and the principle upon which the burners are constructed must conduce to greater efficiency than the old wasteful form of burner formerly used in the conversion of coal grates to gas-fires. A grate is fitted at the stand at the exhibition; and it is attracting a great deal of attention.

A Marvellous Invention.

Invention is a very elastic term, and the quality of the subject-matter for which a patent can be obtained has very wide extremes. Such thoughts cross the mind as the stand of the "Instantfix" Incandescent Burner Company is left, which stand is an addition to the exhibition since its opening. The "Instantfix" incandescent burner is described, in the circulars distributed to the public, as a "patent" and an "invention." It simply consists of an ordinary incandescent burner, with a bottom fitting, so that it can be slipped over a flat-flame burner, and so convert it from an ancient into a modern form of light. That is the whole invention; and so it will not surprise readers to learn that "a child can fix it." This marvel of ingenuity has some advantages of extraordinary value. The incandescent burner can be instantly removed in the event of a mantle breaking, and what is equally astonishing is that the ordinary flat-flame gas burner can then be lit. No experience of gas-fitting is necessary in slipping on the incandescent burner; and it follows that gas-fitters' charges are dispensed with. Prodigious! The flat-flame burner, it is stated, acts as a governor for the incandescent burner. The greatest value of the "invention," it appears to us, is as an aid to the demonstration to the public of their foolishness in sticking to flat-flame burners, while they can get three times the light for a less consumption of gas by the use of any cheap "C" form of burner, even though it is not described as a "patent," an "invention," or goes by the name of "Instantfix." A plain form of adaptor, and anyone who does not like the trouble of screwing in a flat-flame burner in the event of a mantle collapsing and another not being available, can have something as good as an "Instantfix."

SPECIFIC GRAVITY AND THERMAL EXPANSION OF SOLUTIONS OF NAPHTHALENE.

Carl Forch has lately tested the solvent action of toluene, carbon bisulphide, chloroform, and ether on naphthalene. The value of the expression $\frac{s-Qe}{m}$, where s and Qe are the specific gravity of the solution and solvent respectively, and m is the molecular concentration of the naphthalene, increases with falling concentration in toluene, carbon bisulphide, or ether; whereas in chloroform solutions the reverse is the case. In every instance the specific gravity observed is less than is to be expected from the specific gravities of the solvent and of solid naphthalene—that is to say, there is an increase of the molecular volumes. A noteworthy illustration is the fact that a 32 per cent. solution of naphthalene in carbon bisulphide is lighter than solid naphthalene.

The specific heats of solutions of naphthalene in the above-named solvents and in benzene have been determined, and when the results are plotted graphically, it is found that the specific heat of the solutions varies almost rectilinearly with the concentration. From the results, the specific heat of naphthalene has been calculated to be 0·354, though the value from the solutions in ether is 0·427. The specific heat of solid naphthalene is 0·32, that of the liquid 0·41. Therefore naphthalene dissolved in carbon bisulphide, benzene, toluene, or chloroform has a specific heat slightly higher than solid naphthalene; while in ethereal solution its specific heat is nearly that of naphthalene in the liquid state.

The heat of solution of naphthalene in the same solvents, showed that in benzene, toluene, and chloroform the heat of solution is independent of the dilution; in carbon bisulphide it is a trifle higher at higher concentrations; and in ether there is a distinct increase in the figure as the concentration rises.

Solvent.	Heat of Solution. Calories.	Solvent.	Heat of Solution. Calories.
Carbon bisulphide . .	35·04	Chloroform	27·04
Toluene	32·60	1·63 per cent. ether . .	28·07
Benzene	32·26	8·44 ,, ,, ,, . .	29·26

The heat of fusion of naphthalene is 35·6 calories, and agrees with the heat of solution in carbon bisulphide. There is a difference between the heat of fusion and the heat of solution in toluene and benzene, and a greater difference in the cases of chloroform and ether.

At a special meeting of the Macclesfield Town Council, the question of filling the vacancy in the managership of the gas-works caused by the lamented death of Mr. Ernest L. Newbigging was under consideration. In view of the connection of the Newbigging family with the undertaking, and of the excellent financial results which had ensued, it was thought advisable, if possible, to ensure continuity of that connection. The Chairman of the Gas Committee (Alderman Eaton) expressed his pleasure in announcing that Mr. WILLIAM NEWBIGGING, of the firm of Messrs. Thomas Newbigging and Son, of Manchester, who, for family reasons, contemplated taking up his residence in Macclesfield, would be willing to become consultant to the Gas Committee on the understanding that he is allowed to retain some of his present clients in connection with matters which will not necessitate his absence from the town. It was unanimously resolved to appoint Mr. Newbigging as Consulting Gas Engineer to the Corporation at a salary to be determined at a subsequent meeting.

NAPHTHALENE AT LEICESTER.

THE following further particulars, supplied by Mr. Colson, with regard to his process for dealing with the naphthalene difficulty at Leicester, will prove interesting to readers.

The figures in the first table show the position as regards naphthalene for the months of October and November last, as compared with the corresponding months of the previous year. It will be observed that the total number of complaints for the month of October was 139, against 1518 last year. Of the former number, 129 occurred in the district supplied from the Belgrave Gate works; the remaining 10 being in the district supplied from both works. No case occurred this month or in the previous three months in the district supplied entirely from the Aylestone Road works. For November, the total this year was 48 only, against 3047 last year; and these occurred in the district supplied from the old works, with the exception of four, two of which were in the district served at times from both works, and the other two were in the district supplied from the Aylestone Road works—the only cases during five months—and were in connection with two houses which during naphthalene epidemics have had to be visited twice weekly in order to keep the services clear.

TABLE I.—*Number of Naphthalene Cases in the District.*

Day of Month.	October.		November.	
	This Year.	Last Year.	This Year.	Last Year.
1	4 B	36	2 B	None
2	None	66	1 B 2 C	82
3	3 B	68	4 B	45
4	1 B	None	3 B	56
5	4 B	40	4 B	42
6	2 B	34	None	151
7	11 B 1 C	31	1 B	242
8	6 B	31	1 B	None
9	None	37	2 B	409
10	12 B 2 C	31	1 B	224
11	9 B 1 C	1	2 B	191
12	11 B 1 C	76	None	140
13	5 B 1 C	53	,,	134
14	6 B	57	1 B 2 A	69
15	5 B	64	3 B	None
16	None	80	1 B	68
17	2 B	96	2 B	58
18	4 B 1 C	8	1 B	69
19	10 B 2 C	69	5 B	143
20	3 B 1 C	68	None	180
21	5 B	46	2 B	227
22	6 B *	42	1 B	None
23	None	52	None	78
24	4 B	61	1 B	68
25	None	2	1 B	46
26	4 B	104	1 B	33
27	2 B	62	None	74
28	5 B	71	2 B	100
29	4 B	48	1 B	None
30	None	71	1 B	118
31	1 B	43	—	—
Total .	139	1518	48	3047

* Since the 22nd of October, the gas at the Belgrave Gate works has been treated with solvent in the form of a very fine spray or mist delivered in the 24-inch inlet-main to the purifiers, in the opposite direction to the flow of the gas.

Remarks.—A. Gas from the Aylestone Road works. B. Gas from the Belgrave Gate works. C. Gas from both or either works.

TABLE II.—*Quantity of Gas Treated for Naphthalene and Total Make, October and November*, 1904.

1904. Week Ending.	Aylestone Road.		Gas Treated per Cent.	Belgrave Gate.	Total Gas Made.	Total Treated.	Treated per Cent.
	Gas Treated.	Gas Untreated.		Gas Made, Untreated.*			
Oct.—	Cub. Ft.	Cub. Ft.		Cub. Ft.	Cub. Ft.	Cub. Ft.	
6	17,040,980	10,574,020	61·71	8,189,000	35,804,000	17,040,980	47·59
13	26,387,055	1,669,945	94·04	8,857,000	36,914,000	26,387,055	71·40
20	28,217,000	nil	100·00	10,861,000	39,078,000	28,217,000	72·20
27	28,748,000	nil	100·00	11,965,000	40,713,000	28,748,000	70·61
Nov.—							
3	29,776,000	nil	100·00	12,001,000	41,777,000	29,776,000	71·27
10	30,401,000	nil	100·00	13,143,000	43,544,000	30,401,000	69·81
17	32,061,000	nil	100·00	14,700,000	46,761,000	32,061,000	68·56
24	32,143,000	nil	100·00	15,044,000	47,187,000	32,143,000	68·11

* Since the 22nd of October, the gas at the Belgrave Gate works has been treated with solvent in the form of a very fine spray or mist delivered in the 24-inch inlet-main to the purifiers, in the opposite direction to the flow of gas.

From the second table it will be noticed that from the 13th of October the whole of the gas produced at the Aylestone Road works has been treated for naphthalene, not because it was felt to be actually necessary, but as a matter of precaution. The process of washing the gas with solvent has not yet been adopted at the old works—the apparatus for the purpose not having been delivered; but, as an experiment, on the 22nd of October an arrangement was put into operation for using the solvent delivered in the form of a very fine spray, approaching a mist, in the 24-inch inlet-main to the purifiers, in the opposite direction to the flow of the gas. Since the date named, the whole of the gas produced at these works has been treated in this way; the quantity of oil used corresponding very nearly to the quantity per 1000 cubic feet used at Aylestone Road. While this is not so effective as the washing process, it is perfectly evident, upon reference to the tables, that even in this form considerable benefit has been derived from the use of the solvent, the cases of naphthalene in the Belgrave Gate district being reduced from 139 to 46. In making the comparisons with last year, the recent severe weather should be borne in mind. There is no doubt that, had the same conditions of working obtained this year as last, the naphthalene complaints, owing to the low atmospheric temperature, would have been very considerable.

It may be added that during the period referred to the carbonizing plant has been worked at a much higher temperature than during the corresponding period last year, with the result that a larger quantity of gas per mouthpiece and per ton of coal has been obtained; and also that up to the present no water gas whatever has been made.

CHEMICAL ENGINEERING.

THE name of Mr. George E. Davis will be known to many of our readers as that of one of the Inspectors appointed by the Local Government Board, in the early days of the Alkali Works Regulation Act, and a member of an earnest band of workers who were instrumental in founding the Society of Chemical Industry. The extension of the operations of that Society throughout Britain, has during the last decade gone further—reaching Canada and the United States of America; and the robust vitality which marks its career there has lately been exemplified in the annual meeting held in New York, under the presidency of Sir William Ramsay, F.R.S. The attendance there of industrial chemists from every part of the civilized world, was at once a testimony to the good work done by the Society as the result of the pioneer labours in which Mr. Davis largely shared, and a recognition of the good yet to be done by a spread of the knowledge of chemical engineering. Though there have always been a select few who have recognized the value of adequate mechanical equipment in the carrying out of chemical operations, yet no organized attempt to supersede the rough-and-ready methods that generally obtained was made until the days when the Society of Chemical Industry was founded. Coincident therewith sprang up such masters of the craft as Dr. Hurter, Ludwig Mond, George Beilby, William Young, and others whose names will rise in the memory as having achieved great things for the advance of technical progress in this domain. We have mentioned this movement for the purpose of indicating the parallelism which exists between it and the work aimed at by a treatise we are about to review.* The first edition was published in 1901, and the present one gives evidence of the close attention that its author continues to give to a group of industries in which chemical and physical questions, with their engineering application, occupy a leading part. To understand the scope of the handbook, it is necessary to bear in mind the intimation of the author that it is not intended to enable anyone to erect a works from its pages, but to illustrate the principles by which plant of any kind may be designed and erected when certain conditions and requirements are known. The very considerable variety of chemical manufactures must, indeed, prevent any one work dealing satisfactorily with even a portion of them; and therefore it comes about that these volumes are limited to the discussion and illustration of the principles of the operations and the mechanism, using the last term to include all agencies by which the end sought may be realized.

Of all branches of chemical engineering, perhaps that of gas manufacture, including the treatment of the bye-products, is one of the most important—more especially when the magnitude of its operations as affecting the engineering side, and the subtlety of the various chemical processes, are remembered. Yet though there is no one chapter devoted to gas-making, to tar distillation, to the production of dye-stuffs, or to the salts of ammonia, yet there are numerous methods described and operations studied that touch very closely the interests of these branches of manufacture, and materially aid the gas engineer. With the constant advance in mechanical appliances, structural completeness, and chemical knowledge of the fundamental reactions of the various commercial processes, it is necessary for those in charge of chemical undertakings to know whither modern progress is tending, and how far new proposals have the support of theoretical possibility and the prospect of successful translation into financial gain. In this direction, and in the ground work which is laid for further individual examination prior to the exercise of responsible judgment,

* "A Handbook of Chemical Engineering." By George E. Davis. Second edition, revised and enlarged. Two volumes, each 520 pp., large 8vo. Manchester: Davis Bros.; 1904.

the volumes are of distinct worth. Besides thus aiding the selection of methods and plant which each engineer must make to suit the needs of his case, there is afforded much information as to chemical behaviour, and the physical and electrical considerations intimately allied therewith.

In this edition, almost every chapter has received new matter, and those which have been considerably augmented are included in the list which follows, serving as it also will to set out more clearly the general nature of the subjects and their treatment: (I.) Materials used in plant construction, steam production and distribution, power and its application, treating and preparing solids, separating solubles from insolubles, crystallisation and dialysis, organization and building. (II.) The application of heat and cold, absorbing and compressing of gases, evaporation and distillation, electrolysis, and electro smelting are also chapters that are greatly enlarged by the study of new processes and recent developments of the manufacturing chemist. The electrical chapter, besides dealing with electric furnaces, describes at length the electro-magnetic separation of substances, chiefly ores in which there are constituents of varying magnetic character. The simplest methods shown provide for the separation of three classes. In the case of natural monazite sand, by means of the particular machine illustrated, separation is made one after the other of titanic iron, rutile, and monazite sand; while the quartz runs off the belt as the non-magnetic portion. There is no mention of any magnetic separator applicable to the sorting of iron from coal, such as would be of service in connection with the coal feed into mechanical breakers; but the description in the book of methods already successful for other purposes may suggest a starting-point for a modification suitable to gas-works requirements. Quite recently the patent records disclosed the fact that Edison has devised an electro-magnetic separator; and if a similar order of inventive skill be brought to bear upon the problem just mentioned, success might ultimately result. The damage which may occur by a lump of iron gaining access from a coal truck to the jaws of a coal-breaker is serious; and as the trouble not infrequently happens, there is room for a well-devised preventive.

Of the subjects treated, the questions of lead burning, lime mixing, acid elevating, syphons, pyrites burners, and the manufacture of liquid ammonia are all of very considerable importance in relation to the manufacture of sulphuric acid and sulphate of ammonia; while evaporation under vacuum, systematic distillation, refrigeration, and lime kilns are all processes that have received either actual or projected application in various gas-works. The use of Seger cones for the defining of fusibility of fire-clay or for the determining of temperatures is referred to, and the method of fixing the scale explained; and their extended application on the Continent, and their proved utility in connection with pottery and other high temperature kilns in this country, would lead us to expect that the information will be useful in gas-works. The delivery of large volumes of air and gas, in the present day, has made it advisable that means should be devised for approximately ascertaining the volume passing; and for this purpose the Pitôt tube has been incorporated in different forms of dynamic pressure indicator. The author shows several forms of its application in anemometers specially applicable where the nature of the gas by its chemical action prevents direct measurement by the movement of metallic mechanism.

Professor Ripper's mean pressure indicator for steam-engine cylinders, the Parsons and De Laval turbines, briquette machinery, shaking screens, and air compressors are some of the applications of mechanical engineering which receive attention; and water softening as an aid to clean boilers is also described in its main features. The production of fuel gas for engines and water gas is mentioned, so far as it is embodied in typical plants; and the important subject of rescue from poisoning by these and other gases is dealt with at the end of the second volume. The absorbing of gases by liquids is discussed at considerable length, as, indeed, are the general propositions of the interactions between solids, liquids, and gases; and the questions of agitation, repose, and extended surface of contact are studied in relation to the various forms of washer and scrubber in use in gas and chemical works. As might be expected from the prominent position taken of late years, electro-chemistry is dealt with in much detail; the various electrolytic processes receiving description and illustration. Another subject also of late growth—viz., liquid air and its applications—receives due recognition.

Though in this review we have confined detailed references almost wholly to those aspects which immediately appeal to the engineer in charge of gas or residual products works, yet, of course, it will be understood from our general observations that there is a great deal more which will be useful to him, as well as matter which finds its purpose in other departments of chemical industry.

Death of Mr. S. R. Flavel.—We regret to learn that Mr. Sidney R. Flavel succumbed at one o'clock yesterday to the serious injuries he sustained as the result of the motor-car accident to which reference was made in the "JOURNAL" for the 22nd ult. It was hoped that he would in time recover from its effects; and early last week that hope appeared brighter than it had been during the critical period through which he had passed. Unfortunately, however, he had a relapse, which terminated fatally.

THE GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 791.)

BUSINESS on the Stock Exchange last week was not uniformly active or progressive. Brisk and buoyant periods were separated by intervals of quiet and a tendency to weaker prices, but on the whole the better tone prevailed. The settlement of the long account was a heavy affair, and gave rise to some anxiety; and a sinister incident was the failure of an outside concern, which insiders call "only a big bucket-shop." In the Money Market, a good demand stiffened rates materially; but the position at the close was easier, and in discount rates the course was much the same. The chances of the 3 per cent. Bank rate holding out till the end of the year, to which we adverted last week, are looking even better so far as can be seen. Business in the Gas Market was brisk and active, almost equal to the week before; and the great reinstatement of prices proceeded merrily. Those who quietly bought for investment the good things offered at wretched prices not a year ago, are reaping the reward of their foresight. In Gaslight and Coke issues, the ordinary was again very active and very steady. The opening bargain on Monday and the closing bargain on Saturday were at 97⅛, but the bulk of the transactions were marked at better figures, which touched 98⅜ once. The maximum was not dealt in. The preference ranged from 108½ to 110, excluding a small parcel specially dealt in; and the debenture changed hands at from 88 to 88¾. South Metropolitan was not much dealt in; but it advanced a point, the range of the marked prices being 129½ to 130½. In the debenture, there were a few dealings at 88½-89. In Commercials there was one transaction in the 4 per cent. at 111½, and one in the 3½ per cent. at 106½. The Company are offering a small balance of the 4 per cent. stock for tender at not less than 110, affording an opportunity to would-be investors. In the Suburban and Provincial group, business was light, but many stocks rose in price—viz., Brentfords, Brightons, Lea Bridge, Newcastle, Sheffield, South Suburban, and Wandsworth. Brighton original marked 220, and British 40½. North Middlesex was done at 20⅛, and South Suburban at 123; and there were a couple of transactions in West Ham at 100¾. Nothing was done in Wandsworths, but all three issues had a smart rise, consequent upon the Company placing £10,000 "C" stock at the Mart on Tuesday at a fraction better than 114. The Continental Companies were quiet. Imperial slipped back a point, transactions dropping from 207 to 205¼. European fully paid advanced, business being done at 20¼; and the part paid marked 14½. Union ordinary gained a point, and the preference changed hands at 136. Among the remoter undertakings, there was a general rise in debenture issues. Cape Town ordinary sold at from 14½ to 15 1/16, and the preference at 9 19/32. Buenos Ayres debenture fetched 96½ and 97, and Monte Video 10¼ and 10⅜. South African was dealt in at 16¼, and River Plate at from 11 11/16 to 11⅞. Ottoman was done at 5⅜. Primitiva ordinary changed hands at 5¾, and the preference at 4⅞ and 5.

The closing quotations are shown in our stock and share list.

New Members of the Institution of Gas Engineers.

At the Special Meeting of the Institution of Gas Engineers held at Earl's Court on Saturday week, the following candidates (approved by the Council for insertion in the ballot list circulated among the members) were duly elected:—

MEMBERS.

Henry Coleman Head, Engineer and General Manager of the Winchester Water and Gas Company.

Ernest Körting, Chief Engineer of the Berlin works of the Imperial Continental Gas Association.

Leonard Körting, Chief Engineer at the Hanover works of the Imperial Continental Gas Association.

J. W. Napier, Engineer and Manager of the Alloa Corporation Gas-Works.

D. W. Tooms, Manager of the Gas-Works, Fermoy.

ASSOCIATE MEMBERS.

Edward C. Herring, Assistant-Engineer, Gas-Works, Dover.

Reginald Bernard Silcox, Manager of the Garw and Ogmore Gas Company's works, Pontycymmer, Glamorganshire.

John T. Turpie, Assistant-Manager, Gas-Works, Rugby.

John Urquhart, Assistant-Engineer, Gas and Water Works, Aldershot.

Sir George Livesey.—Our readers and the large number of friends of Sir George Livesey in the gas industry will, we are sure, be pleased to learn that he has sufficiently recovered from his recent severe illness to allow of his travelling to Eastbourne. It may be confidently hoped that the change of air will be effectual in restoring to him the activity which for so many years has been devoted to the interests of the great industry with which his name will be for ever associated.

ELECTRIC LIGHTING MEMORANDA.

Electrical Work for Next Session—Ambitious Schemes for London—Wiring and Fitting Proposals—The Cost of Producing Power by Electricity and Gas-Engines—Electrical Machinery and Plant Classed as "Dangerous."

THE completion of the publication of the notices gives some indication of the amount of electrical business that will engage the attention of Parliament in the coming session. The list is an imposing one; but the total does not come up to the number of promotions last session. The quality, however, is not to be judged by the length of the list. Omitting some 65 tramway and railway proposals, there are 63 applications for Electric Lighting Provisional Orders and 21 Power Bills; but several of these are merely for extensions of area and additional powers in other directions. The new promotions for electric lighting are mostly of a minor order, which looks as though the country has almost reached saturation point, or that the experiences of a large proportion of existing undertakings are not sufficiently striking to buoy up hopes of success in yet electrically undeveloped towns. Figuring among the promoters of electric lighting proposals are the Aylesbury Gas Company, the Great Berkhampstead Gas Company, the Hessle Gas Company (the District Council are also promoters), and the Shepton Mallet Gas Company. Other Gas Companies in whose districts electricity supply schemes are being promoted by the governing bodies must consider in good time the question of appealing for the insertion of the Northumberland clauses. This is particularly necessary with the smaller class of local authority promotions where the chances of profitable working are shadowy. The number of electrical Tramway and Railway Bills and Orders shows this to be a favourite line for the exercise of energy; and we look for the electrolysis question again being made a feature next session. No good will be done by slackening the agitation; the more there is of it, the better. Protection and compensation in the event of damage to existing subterranean property, form but a simple act of justice that it is evident will only be secured by keeping the matter prominently before Parliament.

The Electricity Power Bills promise to be of an interesting character—more especially in the London area; certain of the projects being of a mammoth order, and scheduling territory that is already well covered by existing electricity undertakings. There is one concern with the terrible designation of the Administrative County of London and District Electric Power Company, which title is alone enough to frighten existing undertakers. The Company with the long name are equally immodest in their proposals. They are asking to be allowed to take in the whole of London and beyond—embracing, in fact, the insignificant portion of the country extending from Hounslow to Gravesend and from Walthamstow to Croydon and Sutton. Four or five existing companies are asking for further large powers—the active Charing Cross and Strand Corporation being one of them. The East London and Lower Thames Electric Power Company are again going to try their luck, this time we suppose with financial arrangements which will be more acceptable. If only part of these projects is successful, London has before it a lively time in connection with street upheavals. This mass of schemes, in areas already well covered for all purposes of electricity supply, must surely result in Parliament determining upon regulation, and refusing further competitive proposals. The question of wiring and fitting up consumers' premises by local authorities is another matter over which there will have to be strict surveillance. Several local authorities are seeking powers in this regard; and the London County Council are again asking for enabling powers on behalf of the Metropolitan Borough Councils. The electrical contractors, however, as was recently recorded, are going to fight this matter tooth and nail; and gas companies may render assistance to prevent the ratepayers' money being expended to doubtful purpose in this connection. The matter is to be presented somewhat differently by the County Council on this occasion; it being proposed to confer upon the Borough Councils power to borrow the money for wiring and fittings under cover of the expenditure being for the purposes of the Electric Lighting Acts. The Council have our best wishes for an unsuccessful ending to this renewal of their application for these powers.

The Electrical Engineer of Burton-on-Trent must be particularly hard up for good argument in cultivating the sale of his commodity, seeing that, according to the local "Gazette," he has had to have recourse to the queer little booklet entitled "Specific Reasons why Every Tradesman should use the Electric Light," upon which booklet we passed a few criticisms, from information derived as to its contents in our electrical contemporaries, in the "JOURNAL" for Aug. 16. Mr. F. L. Ramsden, the Corporation Gas Engineer, has not been idle, from what we happen to know of the contest for business between the two departments, in defending the interests of his own commodity for lighting and power purposes. It may be suggested that, in these competitive times, an exchange of specially prepared literature on these subjects between gas engineers might be very useful, so that the most telling of the arguments advanced might be selected for printing and circulation. Regarding the use of gas for power purposes, Mr. Ramsden, in conjunction with Messrs. Crossley Bros., have sent out a circular to every power user in Burton; and we think it may be of advantage to reproduce the principal portion of this circular, as it gives, under the circumstances of Burton, a comparison of the cost of producing power by electricity and by gas-engines. The circular reads—

As we understand that electricity for motive power is being supplied in Burton at an average price of about 1½d. per unit, a few figures comparing the cost of producing power by this means and by gas-engines may not be without interest. Taking the consumption of medium-sized gas-engines (say from 6 to 14 nominal horse power) as being 16 cubic feet per brake horse power per hour when working at full load, with gas costing 2s. 4d. per 1000 cubic feet (which is the price in Burton), the cost of producing 1 brake horse power is under ¼d. per hour (0·448d.). An electrical unit is 1·3 electrical horse power, which is equivalent to 1·5 brake horse power, allowing for the power absorbed in the dynamo, &c.; and although the very best electrical motors give 90 per cent. efficiency, we doubt whether a small motor would give anything like such good results. If, therefore, you take an electric motor of (say) 10 brake horse power, running on an average at half-load, we feel sure that 1 brake horse power would be the limit obtained per unit registered. Taking this basis as an average, you would have to pay 1½d. to do by electricity what can be done for under ¼d. (0·448d.) by town gas. Owing to the high speed at which an electric motor is run, the wear and tear must be very heavy, and in our opinion quite twice as much as in the case of a gas-engine; and, looked at from the broad point of economy, there can be no question that gas-engines are far and away the cheaper motive power.

Messrs. Crossley offered to send free of cost a skilled engineer to advise all who required counsel on this matter.

The several fatal accidents that have been caused by electrical machinery—true, frequently through negligence—make the announcement that electrical machinery and plant in factories is to be classed as "dangerous" one which gives some satisfaction. In pursuance, says the notification, of the powers conferred on him by section 79 of the Factory and Workshop Act, 1901, the Home Secretary has certified that the generation, transformation, and use of electricity in electrical stations and in any factory, workshop, dock, wharf, quay, warehouse, or other place to which the section applies is dangerous. The Home Secretary has accordingly given notice that he proposes to make regulations to apply to all such places other than electrical stations, in respect of the distribution and use of electricity where the normal working pressure is greater than 250 and less than 650 volts between any two conductors. These proposed regulations provide for the encasing of wires in connection with the supply, the protection of circuits, the control of power supplied to motors and arc lamps, the prevention of shock or fire from switches and cut-outs, the provision of safety-fuses, the insulation of service-lines, and other means of securing safety. The proposed regulations are to be challenged. The electrical section of the London Chamber of Commerce have forwarded objections, so as to secure *locus standi* at the inquiry which will be held in due course. Among other points, they urge the difficulty and inconvenience which will arise from the existence of two sets of regulations—the proposed amended set by the Board of Trade and the other by the Home Office; and they submit that the regulations of the latter should be on uniform lines with the former, so as to obviate confusion. Peradventure, the Home Office may not consider those of the Board of Trade are sufficiently stringent. There is perhaps more reason in the suggestion that the testing departments of electrical manufactories should be exempted from the operations of the regulations, in view of their special circumstances.

GAS-TURBINES.

IN the last number of the "Electrical Review," Mr. E. Kilburn Scott writes in a decidedly hopeful strain on what he terms "The Coming of the Gas Turbine." He mentions that some five or six years ago, experiments were made in Leeds with a gas-turbine, which was actually made to run, though not for long, owing partly to the limited resources of those engaged in the work. Since then the great development of the steam-turbine has attracted further attention to gas-turbines; and it is significant that in the United States both the large electrical companies at Schenectady and Pittsburg are now experimenting in this direction. This is the more important since the latest and largest practice in regard to steam-turbines is now to be found in the work of these two firms. Encouragement is derived by Mr. Scott from the statement made by Mr. R. M. Neilson in the paper recently read by him before the Institution of Mechanical Engineers, and which was reported and commented upon in the "JOURNAL" for the 25th of October, that, when working on Carnot's cycle, between 1600° and 17° C., the greatest possible efficiency is 85 per cent.; whereas a reciprocating gas-engine, working on the Otto cycle with compression to 60 lbs. per square inch, combustion at constant volume, and expansion to atmospheric pressure, gives at most only 37 per cent. of efficiency. As compared with the gas-engine, therefore, there seems to him to be a clear possibility of improvement for the gas-turbine, while an important point to note is that it is relatively of more consequence to have the lower temperature low than to have the higher temperature high; the loss being as much by an increase of 100° C. in the lower, as by a decrease of 500° C. from the higher, temperature. This is hopeful, inasmuch as it is easier to build a turbine for a low temperature than for a high one, even were it not doubtful if turbines can be effectively water-jacketed against an initial temperature of 2000° C.

It is mentioned by Mr. Scott that one of the chief difficulties

with turbines is how to thoroughly utilize the full velocity of the steam or gas; that of the latter being likely to be higher than of steam. A velocity of 4000 feet per second, which is reached by saturated steam at 300 lbs. absolute when expanded adiabatically from a De Laval nozzle, is far greater than the peripheral speed at which metallic bodies can be run. The difficulty resulting from this has in some cases been met by arranging the expansion in stages, and combining the De Laval nozzle with Parsons's vanes. It is suggested that a similar construction might be successful with the gas-turbine. For the purpose of fully understanding the chances of the gas-turbine, a comparison is made between it and the gas-engine. The two chief points in favour of the former are: (1) That the gas can have practically a continuous flow, and thus does its own scavenging, whereas in the gas-engine it must be cut off at every working stroke—usually one in four—with a liability to back-firing which is absent in the turbine; and (2) the turbine, not having any dead-centre, can be more easily governed than the gas-engine which requires a heavy fly-wheel—the governing being effected by controlling the opening of the nozzles.

It hardly seems to be regarded by Mr. Scott as a disadvantage that in the gas-turbine the metal surface with which the gas comes in contact is very much larger than that in the gas-engine, especially if multiple expansion be attempted, since every particle of gas necessarily slides along a metal surface as it passes through the vanes. It is true these may be worked at a much higher temperature than obtains in the case of a gas-engine, because they do not come into intimate contact, as do the piston and cylinder of the latter. Nevertheless, the difficulty of keeping them fairly cool is likely to be considerable. Nor does the question of water-jacketing present to him any more troublesome mechanical problem than the provision of a water supply in the piston of a large gas-engine, which is necessary to prevent back-firing. Mr. Scott is of opinion that, so far as construction is concerned, the inventor of the steam-turbine had a much tougher job than has the investigator into the possibilities of the steam-turbine, for the latter has a mass of facts to work from, and is also at an advantage in having better and stronger materials, and much more accurate machine tools at hand. There is a good deal in the encouragement thus given to investigators which seems to be well founded; and it may be that the steam-turbine points the way to even a greater success than has been achieved by the gas-engine.

THE TESTING OF BURNERS AND MANTLES.

By James F. Smith, of Halifax.

Mr. Mallol, in his letter headed "Some Reflections on the Lighting Question," in your issue of Aug. 2, raises a point which I think explains why the results of different observers vary when testing incandescent burners and mantles—namely, a burner has different efficiencies for different consumptions of gas.

Users of the incandescent system of lighting are generally found to turn the gas up and down after lighting, so as to get the best light, or, in other words, to get the best efficiency from their burner and mantle for the gas they use. If this is applied to the testing of these burners and mantles, it will be seen that the results should not be stated that the burner in question would give so many candles for so many cubic feet of gas per hour; but a series of results should be given, showing that, with the gas in use, the burner and mantle under the test would give different candle powers for different consumptions of gas.

In order to obtain these different efficiencies, it has been the practice here to regulate the pressure of the gas at the inlet to the burner through a series of pressures varying from the highest to the lowest, according to what was thought necessary to obtain a characteristic and efficiency curve on squared paper, if required. The curves shown on the accompanying diagram are those of a burner tested a short time ago.

They show that the illuminating power increases very rapidly with a slow increase of gas consumption until a point is reached, when the illuminating power gradually falls as the gas consumption increases more rapidly.

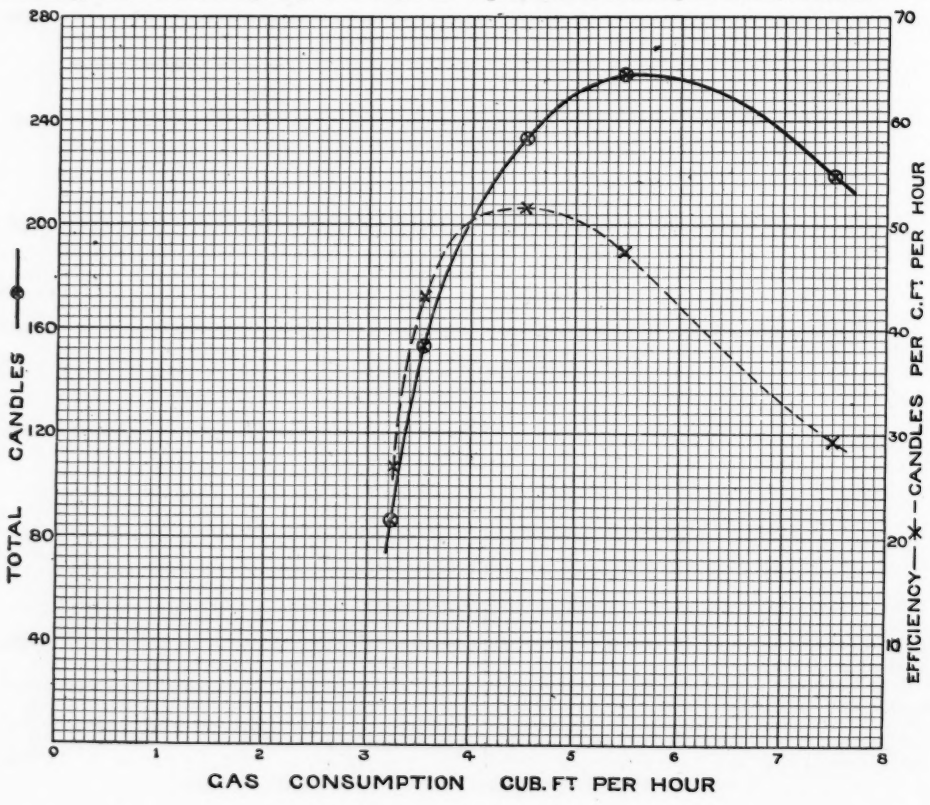
Another interesting point is also brought out by this method of testing. It is that the maximum illumination of the burner is not at the same point as the maximum candles per cubic foot of gas, but higher. This varies, however, with different burners and mantles, and other conditions—such as governing the gas by different types of governors.

The results given in Appendix B to Mr. Holgate's presidential address to the Institution of Gas Engineers (see "Journal" for Feb. 10, 1903, p. 355) do not contain a complete series for the construction of a curve, but only portions of series. The last four tables of determinations show the results of experiments undertaken to reach the highest possible efficiency by means of a single governor with screw adjustment, and with two governors of different types with and without screw adjustment. The burner used in the first table was found to be defective and was not employed in the later determinations—a fact that accounts for the discrepancy pointed out by Mr. Mallol.

I cannot myself see any reason why it should be absurd to certify a burner as having different efficiencies, any more than it would be absurd to certify a steam-engine, or any other piece of apparatus, as having different efficiencies under different conditions of steam-pressure or load.

The comparison of burners and mantles by means of curves is the only method that has proved of service at Halifax; and I should recommend those interested in the testing of incandescent burners and mantles to give it a trial, as the method of testing these at a certain consumption may not suit the gas with which the burner, &c., have to be used, and will lead to conflicting results, as the results may be obtained from any point of its efficiency curve.

I have not yet had the pleasure of working with the Flicker system; but I do not know any reason why it should not be applied to a photometer capable of giving the necessary figures for the construction of the curves before mentioned, with the conditions under which the burner is to be used, though I have not found any difficulty in using the ordinary methods for this purpose and for checking the results obtained.



GAS LEAKAGE.

By F. S. Cripps, Assoc.M.Inst.C.E.

It is of the utmost importance that all who have to do with the management of gas apparatus, should appreciate the enormous loss of gas which may take place through a very small hole—such, for instance, as that left by a rivet falling out of a joint in the gas-holder sheeting. The object of this communication is to give easy rules, followed by a table, indicating the quantity of gas which can escape through small holes direct into the atmosphere. When once this is appreciated, it will be seen how essential it is that all above-ground apparatus, particularly gasholders, should be periodically examined for leaks. We hear so much about "unaccounted-for" gas, but it is to be feared we do not always look in the most likely places to find it.

The quantity of gas escaping from a leak in an underground gas-main is not so serious as that from a similar-sized leak above ground where it has free access into the open air. The ground offers considerable frictional resistance to the flow of gas in the former case, depending entirely on the closeness with which the main is muffled by it. It is therefore impossible to give any hard-and-fast rules for leaks in underground mains, where the gas cannot get away freely. Hence, the rules and tables which follow apply only to leaks into the open air. By the exercise of judgment, they may be serviceable in determining roughly the loss from underground leakage; but this is not their primary use.

The general formula for the escape of gas through an orifice is—

$$V = \sqrt{\frac{2g\,p}{12} \times \frac{773{\cdot}2}{s} \times (1 + a\,t) \times \frac{29{\cdot}92}{h}} \;*$$

Where V = velocity of discharge in feet per second.

$2g = 64{\cdot}4$.

p = pressure of gas (in inches of water) in the vessel from which gas is escaping—*i.e.*, the difference in pressure outside and inside.

$773{\cdot}2$ = volume of air at 32° Fahr. under pressure of 29·92 inches.

s = specific gravity of gas, taking air as 1.

t = temperature.

h = barometric pressure in inches of mercury.

Filling in these values, and assuming $s = 0{\cdot}44$; $t = 62°$ Fahr., and $h = 29{\cdot}92$, we have—

$$V = \sqrt{\frac{64{\cdot}4\,p \times 773{\cdot}2 \times 29{\cdot}92}{12 \times 0{\cdot}44 \times 29{\cdot}92} \times \left(1 + \frac{t - 32}{493}\right)}$$

That is—

$$V = \sqrt{\frac{5{\cdot}37 + 1755 \times 523}{493} \times p} \quad \text{or} \quad 99{\cdot}9\sqrt{p}.$$

* For verification of the general formula, see D. Kinnear Clarke's "Rules and Tables."

which for all practical purposes we may write in the very simple form—

$$V = 100\sqrt{p}.$$

The highly complicated formula with which we started has therefore been condensed into a very simple rule—viz., the *velocity* is equal to 100 *times the square root of the pressure.*

But the velocity is affected by the shape of the orifice, and therefore it becomes necessary to multiply the above formula by a constant, depending upon the kind of opening. For a circular opening in thin plate, such as we are considering, we find that the constant varies (according to Weisbach) from 0·56 to 0·79. Taking it as 0·61, we have—

$$V = 100 \times {\cdot}61 \times \sqrt{p}.$$

Now, given the velocity of the escaping gas, we can easily determine the quantity of gas which will be discharged. We have simply to multiply the velocity by the area of the opening in square feet, or—

$$\frac{d^2 \times {\cdot}7854}{144}$$

when d = diameter of hole. The formula then becomes—

$$Q = \frac{100 \times 0{\cdot}61 \times \sqrt{p} \times d^2 \times 0{\cdot}7854}{144}$$

where Q = quantity of gas discharged in cubic feet per *second.*

It is, however, more convenient to have the quantity per hour or per quarter, as the loss is then more apparent, and appeals to us with greater force. If then, we multiply by 3600 (the number of seconds in one hour), and reducing, we have—

$$Q_1 = 1197{\cdot}7\sqrt{p} \times d^2$$

which for all practical purposes we may write—

$$Q_1 = 1200\sqrt{p} \times d^2$$

This is the practical formula we have been seeking, and it may be written in words thus: To find the quantity of gas (in cubic feet) which can escape per hour from a circular hole in a thin plate, *multiply the square root of the pressure by the square of the diameter of the hole (in inches) and by 1200.*

To give it a practical application, we will suppose that a rivet has dropped out of the top sheeting of a gasholder, leaving a hole $\frac{1}{4}$ inch diameter, and that the pressure of gas in the holder is 8 inches. It is required to know how much gas escapes per hour. Filling the values in the formula, we have—

$$Q_1 = 1200 \times \sqrt{8} \times 0{\cdot}25^2$$

or $$1200 \times 2{\cdot}83 \times 0{\cdot}0625 = 212.$$

That is gas would escape at the rate of 212 cubic feet per hour; and, as there are about 2190 hours in a quarter, the total leakage from the $\frac{1}{4}$-inch rivet-hole would (unless stopped) amount to no less than 464,280 cubic feet, or nearly *half a million cubic feet* per quarter!

Little more need be said; but to still further emphasize the importance of paying attention to what some might otherwise think trivial matters, a table follows giving the loss under various gas pressures from holes of different sizes, per *hour* and per *quarter.* It will be seen that the holes vary from 1-16th of an inch up to 3 inches diameter, and the pressure from 2 inches up to 25 inches of water pressure. A study of this table should convince the most careless of the importance of attending to leaks.

Leakage of Gas under Pressure, through Round Holes in Thin Plates.

Pressures in Inches of Water.	Leakage in Cubic Feet per Hour through a Hole.								
	$\frac{1}{16}$ in. Dia.	$\frac{1}{8}$ in. Dia.	$\frac{1}{4}$ in. Dia.	$\frac{1}{2}$ in. Dia.	$\frac{3}{4}$ in. Dia.	1 in. Dia.	$1\frac{1}{2}$ in. Dia.	2 ins. Dia.	3 ins. Dia.
2	6	26	106	424	954	1,697	3,818	6,788	15,273
4	9	37	150	600	1,350	2,400	5,400	9,600	21,600
6	11	46	183	735	1,653	2,939	6,613	11,757	26,454
9	14	56	225	900	2,025	3,600	8,100	14,400	32,400
12	16	65	260	1,039	2,338	4,157	9,353	16,627	37,412
16	19	75	300	1,200	2,700	4,800	10,800	19,200	43,200
25	23	94	375	1,500	3,375	6,000	13,500	24,000	54,000
Pressures.	**Leakage in Cubic Feet per Quarter. (Holes as above.)**								
2	14,510	58,070	232,280	929,130	2,090,540	3,716,550	8,362,160	14,866,200	33,448,650
4	20,530	82,120	328,500	1,314,000	2,956,500	5,256,000	11,826,000	21,024,000	47,304,000
6	25,140	100,580	402,300	1,609,300	3,621,000	6,437,000	14,484,000	25,749,000	57,936,000
9	30,800	123,200	492,700	1,971,000	4,435,000	7,884,000	17,739,000	31,536,000	70,956,000
12	35,600	142,400	569,700	2,279,000	5,127,000	9,114,000	20 507,000	36,457,000	82,027,000
16	41,060	164,200	657,000	2,628,000	5,913,000	10,512,000	23,652,000	42,048,000	94,608,000
25	51,300	205,300	821,000	3,285,000	7,391,000	13,140,000	29,565,000	52,560,000	118,260,000

Notes on Tables.

This table may be extended indefinitely (either way) by remembering that the *quantity* of gas passing *varies as the square roots of the pressures,* and also as the *squares of the diameters of the holes.*

In this way, it would be serviceable when determining the gas-way in different parts of apparatus; the allowable frictional resistance being represented by the pressure taken either directly or indirectly from the table, and the areas of gas-ways being similarly determined.

At the best, such tables are only approximately correct, as the passage of gas is liable to so many disturbing influences. Hence, fractions of a cubic foot are omitted in the upper half, and the quantities are given in round numbers in the lower half of the table.

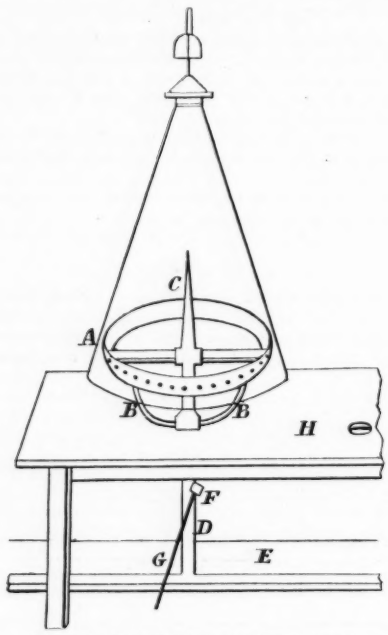
Of course, no leakage from the larger holes given would be likely to continue for three months without being found out; but the quantities have been stated for all sizes mentioned in the upper half of the table, to make it complete.

AN EARLY GAS-COOKER.

Having regard to the unique display of up-to-date gas-cooking appliances now to be seen at the Earl's Court Gas Exhibition, the following description and drawing of one of the very earliest of such appliances will doubtless be read with interest. It is taken from the "Mechanics' Magazine" for the year 1833 (Vol. XVIII., p. 297), and was in response to an inquiry by Mr. J. O. N. Rutter, then of Lymington, and afterwards the well-known Manager of the gas-works at Black Rock, Brighton, who did much in his day to extend the use of gas for purposes other than lighting.

Hicks's Gas Roasting Apparatus.

The gas is admitted to a metallic circle A, through a very narrow continuous opening, round the outside of which the gas issues and forms a ring of blue flame. In the centre, supported by two lateral gas-tubes B joined to the circle, is an upright spike C, serving as a spit on which the meat to be roasted is stuck. From the centre of the circle the pipe D, which supplies the gas, passes down the gas-main E, having a cock F with a regulating lever G by which the gas can be turned on or off, and the degree of flame produced can be regulated with the greatest nicety. The circle is raised a few inches above a bench or table H, so as to admit of the introduction of a convex tin dish, furnished with a spout, for receiving the dripping, under each spit. From this dish the dripping runs off by the spout, and is collected in any common tin dish placed under it. Over the bench at the height of 3 or 4 feet is a projecting boarded canopy or hood for receiving the heated air and smell from the meat and gas, and conducting them to a flue, so as to prevent them accumulating in the kitchen. Directly over the gas circle is a cone of polished copper, suspended by a weight. This cone is 2 inches wider at the base than the gas circle, and it has a small orifice at the top.



Hicks's Gas-Roasting Apparatus.

When the operation of roasting is to be performed, all that is necessary is to spit the meat and light the gas, regulating it so as to produce only a blue flame, closely resembling a blue riband round the base of a black turban; and then to bring down the copper cone until its lower edge is on a level with the base of the gas circle. A vessel to receive the dripping is then placed under the spout of the tin dripping-dish, and the process of roasting goes on, without basting or any other operation whatever being requisite. The heat produced by the gas is radiated from the copper cone on to the meat; and, this being done on all sides, the latter never requires turning, while the heat, not being so intense as that from an open fire, the meat is neither dried nor burned, and, consequently, does not need basting. It is, in fact, roasted by heated air, but air which is constantly renewed; and therefore this operation has no affinity with baking. The time required for roasting in this manner is shorter than that before an open fire, in proportion about 12 to 15. It required 15 minutes to roast every pound of meat before an open fire, and only 12 minutes for roasting the same quantity by gas. As the cones are nicely balanced, in the manner of chandeliers suspended from lofty ceilings, the cook, when she wishes to look at the meat, can raise and lower the cone over it with the greatest ease. The fat drops slowly, and as pure as water, into the dish placed to receive it; and when the period of dressing is nearly completed, it is indicated by the appearance of gravy mixed with the fat. For different joints and game there are rims and covers of different sizes; and for a sirloin of beef, the cone approaches to the form of a cylinder with a domical top. The operation, when the meat is once spitted and the gas properly adjusted, is conducted, or rather goes on of itself, with all the quiet precision of a chemical process in a laboratory; and, in short, with so much cleanliness, neatness, and absence of smell and heat that it would not be offensive in a drawing-room.

On the evening of Jan. 5, 1833, we were present with a number of gentlemen in Mr. Hicks's kitchen, in Wimpole Street, where a part of a sirloin of beef, a leg of mutton, a fowl, and a pigeon were roasted and afterwards tasted by the company, when they were found to be in all respects equal, if not superior, to meat and fowls roasted in the common way. Mr. Hicks's apparatus has only been erected a few weeks, and was, at the time we saw it, not made known to the public. The expense of gas is much less than might be imagined; the effect being produced not so much by intensity of heat as by its concentration. Mr. Hicks has found 16 cubic feet of gas, which cost 2¾d., sufficient for roasting 12 or 14 lbs. of meat, which is considerably less than ¼d. per pound. When it is considered that bread is baked and browned at from 280° to 300° Fahr., and that meat is roasted in bakers' ovens after the bread is removed, the circumstance of gas affording a sufficient degree of heat for roasting will not occasion surprise. We have before described the mode by which boiling and stewing by gas has been some time practised in Edinburgh; and it is clear that as roasting can be effected by it, so can baking. The whole business, therefore, of the preparation of human food by the application of heat may be performed by gas, and that with great economy, in all families who bake and roast at home. This is only realizing what was long ago anticipated by the late W. Strutt, Esq., of Derby. There can be no doubt that oil or any liquid fat burned in the same manner would effect the same end; and, indeed, this is proved by the portable machine, for the use of ships and ambulatory cottages, invented by Mr. Cochrane, and sold by Josse, in Regent Street.

How far the art of cooking by gas will be suitable for country inns may be considered uncertain in the present infancy of the invention; but as, on calculation, it is found in London to be much cheaper than roasting by open fires of coal, and, for small joints, equally cheap with sending meat to be cooked in a baker's oven, it appears highly probable that wherever gas is used for lighting, it will answer to employ it also for cooking. In cities now which are generally lighted with gas, it will probably soon effect an important revolution, for, since every house may be supplied with heat by steam or hot water by companies, domestic fires will become unnecessary; and as the smoke may be burned in the engines of all the manufactories by Wittz's furnaces, our atmosphere may be left comparatively pure, and our town architecture be displayed to as great advantage as town architecture now is on the Continent.

In a subsequent number of the same publication, Mr. Rutter stated that he was "greatly pleased with the gas roaster, invented by Mr. Hicks, and described on p. 297." His letter concludes with a reference which throws light upon the difficulty experienced in those early days by gas managers in extending the use of gas. It is as follows:—

A highly respectable periodical, in speaking of Mr. Hicks's ingenious apparatus, observes "Much, however, remains to be done before the invention can be made serviceable. There are numberless uses for a kitchen fire besides roasting; and few families will be inclined to admit *the most horrible of all nuisances*—a gas-pipe—into their houses on the mere chance of an occasional service in this way." To the words in italics, I object. It may be a matter of taste whether gas shall be admitted to a house either for lighting or cooking; but that the admission of gas constitutes of necessity the most horrible of all nuisances I must deny. The charge is unfair as it is unjust. On my own premises I have upwards of 300 feet of gas-pipe, which supplies, in different situations, 11 burners; but I have never found the gas a nuisance. On the contrary, it contributes essentially to comfort, convenience, and economy. If the gas-pipe or other fittings be defective or insecurely adapted, or if the gas be very impure, then I allow there may be sufficient cause for complaint. These, however, are accidental conditions, and in no respect necessary with the employment of gas. The gas by whose light I am now writing will not stain the most delicate test that the chemist can devise; and throughout the whole length of tubing there is not the slightest escape discoverable.

MANCHESTER AND DISTRICT JUNIOR GAS ASSOCIATION.

Visit to the Middleton Gas-Works.

The members of the above-named Association last Saturday paid a visit to the Middleton Corporation Gas-Works, through the kindness of Mr. E. E. J. Anderson, the Engineer and Manager, who is President of the North of England Association.

The first portion of the works visited was the retort-house, containing two beds of retorts, one set on the horizontal, and the other on the inclined system—only the latter, however, being in use. The members then passed on to the elevated conveyor, and thence to the engine-house. Mr. Anderson mentioned here that the illuminating power of the gas required to be supplied by the Corporation by Act of Parliament was 18 candles; but they usually gave 19½ candles. The visitors next passed into the governor-house. Three districts—viz., Tonge, Rhodes, and Middleton—are supplied from the works, each having a separate governor; the supply of gas going direct to each district. It was explained, however, that in case of breakdown, it could be turned on so as to supply all three districts with one governor. The building containing the washer-scrubbers (Kirkham, Hulett, and Chandler's), which are worked by a gas-engine, was the next portion of the works inspected. The meter-house and the sulphate plant (Schwab's), producing a ton of sulphate per day, having been visited, the members came to the purifier-house, containing four oxide purifiers with bottom discharges. They

were shown the laboratory containing the usual testing apparatus, which includes one of Simmance and Abady's calorimeters; and they then passed through the stores, where Mr. Anderson stated that only dry meters are employed, as he is in favour of them. This completed the inspection of the works.

Luncheon which had been provided for the members having been partaken of, they assembled in Mr. Anderson's private office. An apology was first offered by him for the absence of the Chairman and Deputy-Chairman of the Gas Committee —the latter gentleman having been seriously ill. The President (Mr. Harold Smith, of Bury) said he was sure all the members were much obliged to Mr. Anderson for the kind manner in which he had conducted them through the works; and he would ask Mr. Dudley to propose a vote of thanks. Mr. J. E. Dudley (the Vice-President) said it was a pleasure to him to comply with the President's request. Wherever the members went they always found something new. The settings at Middleton were somewhat different from others they had seen elsewhere. He was pleased to see that Mr. Anderson had the full control of the works, from the manufacture to the burning of the gas. He was also glad that they had incandescent gas lighting in use. He came to Middleton under the impression that the offices were all lighted by electricity; but he found they had something more brilliant and lasting, in the shape of gas. Mr. Handley (Rochdale) seconded the proposition. The Secretary (Mr. A. Holton, of Manchester) said he should like to support the resolution, because of the valuable time Mr. Anderson had spent with the members. He had given those who were still students, as well as those who were not, some good advice in the retort-house, where the greater portion of his explanations had been so kindly afforded. Mr. Anderson, in responding, thanked the members for their kind appreciation of his services, and said that at any time he would always be willing to do anything he possibly could for them. He was in sympathy with the Juniors, and did not agree with the older Associations ignoring them. This was not the case with his Association, as the Juniors were allowed to attend their meetings to see what went on, and also to help. The proceedings then concluded, and the members separated.

THE THEORY OF THE WATER-GAS PROCESS.

Part II.

By Drs. Hugo Strache and Rudolf Jahoda, of Vienna.

[Abstract translation from the "Journal fur Gasbeleuchtung."]

A translation of a dissertation by the authors was published under the above title in the "Journal" in 1901.* The groundwork of this dissertation was a large series of tests carried out on a water-gas generator. It was shown thereby, on the one hand, that, contrary to the views expressed in Dellwik's (German) patent specification No. 105,511, the efficiency of the "blows" in a generator could be raised neither by increasing the rate of flow of the air blast, nor by diminishing the depth of the bed of fuel, but only by maintaining a low general temperature in the generator, whereby carbonic acid was formed during the "blows," and they consequently had a good efficiency. On the other hand, it was shown that the efficiency during the "runs" was dependent on the temperature and the rate of flow of the steam; so that, even with a relatively low temperature, a good decomposition of the steam could be secured provided the steam was passed through the fuel at only a low rate of flow. The total efficiency of the gas production as a whole, combining "blows" and "runs," attained a maximum at a particular temperature and a particular rate of flow of the steam.

The older processes of water-gas manufacture aimed at securing a high temperature during the periods of blowing up the generator, in order that much steam could be decomposed during the runs. This high temperature was produced by blows of long duration (10 minutes); and in consequence of the high temperature, the carbon was consumed to carbonic oxide. The gas as it escaped from the generator contained only 2 to 5 per cent. of carbonic acid. The large quantity of carbonic oxide escaping during the prolonged blows connoted a poor efficiency. Dellwik's process for making water gas aimed at effecting the combustion of the carbon direct to carbonic acid, and thereby securing a good duty, by the adoption of a high blast pressure and a small depth of fuel. The authors' dissertation, already quoted, showed, however, that neither complete combustion to carbonic acid nor combustion as claimed in Dellwik's patent—viz., such that the products should contain more carbonic acid than carbonic oxide —was attainable except at very low temperatures, at which the efficiency during the runs becomes affected by undecomposed steam if a rate of flow of steam suitable for practical working is maintained.

The authors were able to foresee that the best efficiency could be secured by maintaining a moderate temperature, at which neither the loss through the blows nor the loss during the runs affects the effect as a whole. It was shown in their first dissertation what rate of flow of the steam was most favourable for any particular generator temperature; and the object of the present paper is to prove what is the most suitable temperature to maintain in a generator in order to secure the best yield in water gas. The results have, as far as possible, been brought into generally applicable formulæ; but many values, especially temperatures, could only be found indirectly, and these have not so high a degree of accuracy as could be wished. The observations were made on one generator throughout; and it would be advantageous for the values to be found on other generators, and more exactly. But while more exact determinations of some values would perhaps show deviations within certain limits from those that are here recorded, yet substantially the deductions made from the formulæ would not be thereby affected.

In considering the authors' results, it must be remembered that their researches were made on a generator in which the heat was not uniformly distributed; and hence their results are not comparable with those obtained by investigators who worked with uniformly heated carbon. Dr. Kramers has essayed such a comparison of the authors' results and those obtained by Lang and Harris. But in the authors' generator, the temperature ranged from 1500° to 1700° C. at the bottom to about 300° to 500° C. at the top; and though it may be said to have a mean temperature of (say) 800° C., the lower layers have a far more complete decomposing action on steam than a long layer of carbon uniformly heated to 800° C. in a tube would have. Hence the average temperatures of the fuel given by the authors are not comparable with those of the carbon in Lang and Harris's researches, and cannot be made comparable by calculation.

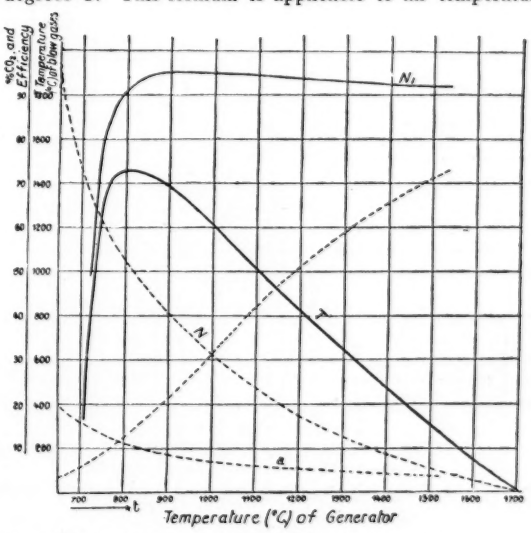
The authors aimed at making their researches under the conditions prevailing in practice—that is to say, on a generator with air blast passing from the bottom upwards. The steam during the runs entered at the top and passed downwards. The researches apply therefore only to generators worked under these conditions. If both the blows and runs are from below upwards (as is the case with many English and American systems), the conditions are somewhat altered, as there then prevails a more uniform distribution of temperature in the generator. This is, however, not favourable to the ultimate result, as will be shown later. The radiation from the generator was taken into account in the authors' earlier dissertation, and is also in the general formulæ now given; but it has been disregarded in calculating the numerical values which follow, because the authors satisfied themselves that it was of no moment with well-insulated large generators, except when the make of gas was very small owing to the rate of flow of steam being lower than would be practically used. The subject will be again discussed under the two sectional headings—viz., the "Blow" and the "Run."

I.—The Blow.

The dependence of the proportion of carbonic acid in the effluent gas on the mean temperature of the generator is, for convenience, shown in a general formula. It was found, purely empirically, that the formula which best corresponded with the actual conditions was

$$a = \frac{3730}{t - 467}$$

in which a represents the percentage by volume of carbonic acid in the effluent gas and t the mean temperature of the generator, in degrees C. This formula is applicable to all temperatures



N_1 = Efficiency of the run for a rate of flow of steam = 6.
T = Total efficiency for a rate of flow of steam = 6.
N = Efficiency of the blow.
a = Percentage of carbonic acid in the blow gases.

Fig. 1.

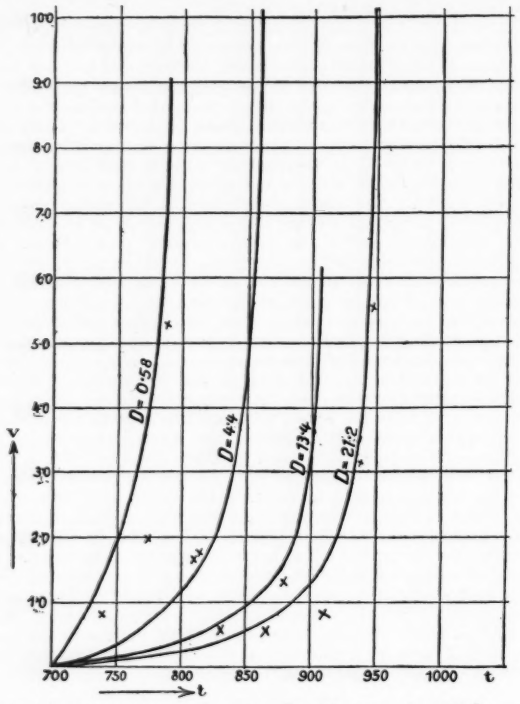
above 650°C.; and the relation it expresses is shown diagrammatically by the curve a in fig. 1. A comparison of this curve with the curves resulting from the authors' former researches shows that the formula is a serviceable one.

* See Vol. LXXVII., pp. 27, 87, 145, 208, 275, and 401.

The efficiency (= N) for the blows is given by the following formula, in which t_1 = the temperature, in degrees Centigrade, of the escaping gases:—

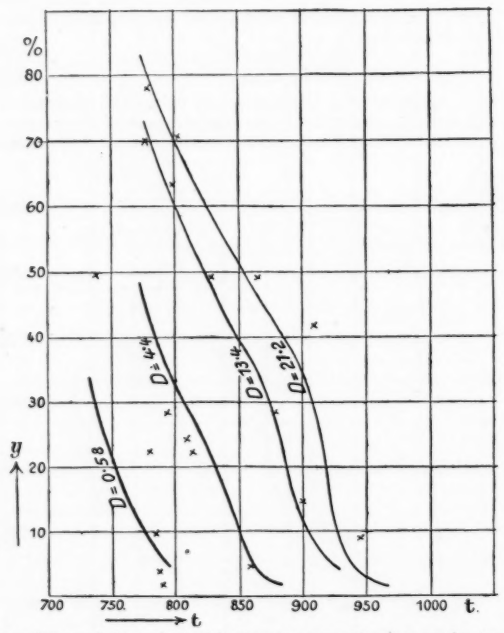
$$N = 100\,\frac{46{,}000 + 2176\,a - t_1\,[a\,(0{\cdot}086 + 0{\cdot}000347\,t_1) + 30{\cdot}69]}{8080\,(18{\cdot}6 - 0{\cdot}348\,a)}$$

The curve resulting from this formula is shown under N in fig. 1. The manner in which the formula is obtained, and the dependence of t_1 on t, are explained in the Appendix (*vide infra*). It will be seen from the curve N that the efficiency of the blow is, for a mean temperature of the generator of 650°C., 95·1 per cent.; while it falls off to 52·7 per cent. for 800°C., to 31·2 per cent. for 1000°C., and to 5·3 per cent. for 1500°C., and at 1710°C it becomes *nil*. The latter is the highest temperature attainable by the passage of a cold blast through hot carbon previously heated up by the effluent gases. With the older water-gas processes, in which average generator temperatures above 1000°C. were employed, the efficiency of the blow thus amounted to less than 30 per cent. The Dellwik process, which prescribes more carbonic acid than carbonic oxide—that is to say, more than 14 per cent. of carbonic acid—in the escaping gas, can only be carried out at lower temperatures.



Ratio (v) of decomposed to undecomposed steam depending on the temperature (t) of the generator, for different rates of flow (D) of steam.

FIG. 2.



Dependence of the volume (y) of undecomposed steam on the temperature (t) of the generator for different rates of flow (D) of steam.

FIG. 3.

II.—THE RUN.

In order to determine the efficiency for the run, it was in the first place necessary to establish a formula for the ratio between decomposed and undecomposed steam at different temperatures and with different rates of flow of the steam. This ratio (= v) is very small at low temperatures, but increases very rapidly up to a temperature which is distinctive for each rate of flow of steam, and then, even at a few degrees higher, becomes almost infinite. The following formula, which has been found purely empirically, best expresses this ratio:—

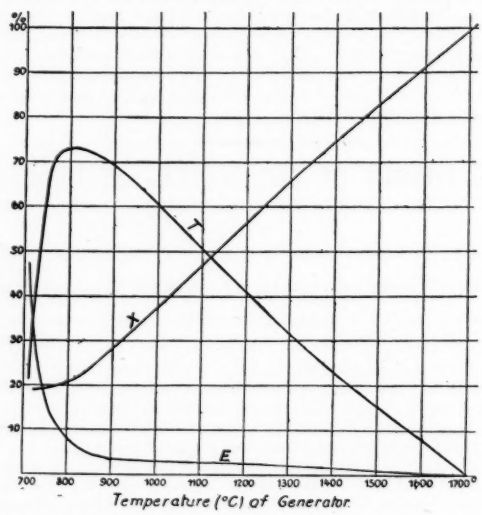
$$v = 5\,\delta + (\delta\,\tau^2)^5$$

in which $\delta = \frac{\tau^2}{D}$ and $\tau = \frac{t - 700}{1000}$ while D = the rate of flow of the steam.

The proportion of carbonic acid in the water gas is dependent on this ratio between the decomposed and undecomposed steam in such a manner that the greater this ratio—that is to say, the smaller the quantity of steam passing through undecomposed—the smaller is the proportion of carbonic acid in the gas. The percentage (c) of carbonic acid is shown by the following formula, which likewise has been formed empirically.

$$c = \frac{13{\cdot}5}{\sqrt{v} + 0{\cdot}4}$$

From the two values v and c just referred to, the undecomposed steam might be calculated as a percentage (y) of the total volume of the mixture of gas and steam. The diagrams, figs. 1 and 2, show the values of v and y graphically. The curves correspond with the calculated values; and the points marked indicate the values found experimentally, as recorded in the authors' earlier dissertation. It will be seen that there is satisfactory concordance.



Heat balance as percentage for the rate of flow (D) of steam = 6.
T = Total efficiency.
X = Loss in the blows.
E = Specific heat of the gas.

FIG. 4.

Finally, a formula had to be found for the temperature of the escaping water gas, which temperature is dependent on that of the generator and on the rate of flow of the steam. There could be calculated from the heat of formation (= B) of the water gas, as calculated in Part I., the specific heat (= E) of the mixture of gas and steam, the quantity of gas made (= G), and the radiation (= S), the total amount of cooling of the generator in the runs, thus—

$$A = B + E + \frac{S}{G}$$

It must be pointed out in this connection that the water gas does not, as might be supposed, leave the generator at the temperature of the lowest layer of coke. In generators with upward blows and downward runs, very rapid cooling of the gas takes place on the cold walls of the lower part of the generator; so that the temperature of the escaping gas becomes considerably lowered. Obviously this depends on the rate of flow of the steam, as with a high rate there is less opportunity for the cooling of the gas. Therefore, the gas leaves the generator so much hotter the higher is the rate of flow of the steam. This heat, being stored up in the lower part of the generator, is imparted to the air of the blast, and must not therefore be regarded as lost.

The cooling (A) of the generator in the run, with the heat of combustion (V_1) of the water gas made, and the amount of carbon (C_1) consumed in the run, give the efficiency (N_1) of the run, thus—

$$N_1 = 100\,\frac{V_1}{8080\,C_1 + A}$$

Neglecting radiation, the value of which is small, the curve N_1 in

fig. 1 indicates the efficiency of the run with a rate of flow of steam of—*e.g.*, 6. At this rate of flow, the efficiency reaches its maximum of 95 per cent. at 900° C., and even at 800° C., which is the temperature at which the proportion of carbonic acid in the blow gases is 11 per cent., attains 91 per cent. Above 900° C., the efficiency of the run gradually falls, in consequence of the higher temperature of the out-flowing gas, from 95 to 90 per cent. It will be seen from the curve that at lower temperatures, corresponding with a proportion of more than 13 per cent. of carbonic acid in the blow gases, the efficiency of the run is much lower.

The total efficiency of the blow and run together, represented by T, is given by the following formula:—

$$T = 100 \frac{V_1}{8080\ C_1 + 100 \frac{A}{N}}$$

It is displayed by curve T in fig. 1. Its maximum of 73 per cent. is at 800° C. At lower temperatures, it falls away rapidly, in consequence of the bad efficiency of the run, and at higher temperatures it declines again, because of the bad efficiency of the blow, and at 1710° C., where the latter efficiency becomes *nil*, it likewise reaches the zero line. With lower rates of flow of steam, the maximum naturally is shifted somewhat to the left, towards the lower temperatures, and with higher rates of flow in the opposite sense. If radiation is taken into account, the maximum also is shifted somewhat to the right, because with a greater make of gas, which corresponds with a higher temperature, radiation plays a smaller part. Under all conditions, the maximum remains between the moderate temperatures of 750° to 1000° C., and therefore falls within the limits of temperature at which the proportion of carbonic acid in the blow gases is from 12 to 7 per cent.

It is plain that, at these temperatures, the blow gases still contain a considerable quantity of carbonic oxide, of which the heat of combustion can be recovered in regenerators. In this manner, it is possible, by pre-heating the steam, to raise the total efficiency to over 80 per cent. In the system under consideration, however, with upward blows and downward runs, the upper layers of coke serve partially as a regenerator, as they absorb heat from the effluent blow gases and give it up afterwards to the steam. It is only by this process that it is possible to keep the loss of heat through the blow gases so low. If the principle of counter-flow is discarded, and the steam is introduced at the same end of the generator as the air-blast, the temperature will be more uniform throughout all layers—*i.e.*, the lower layers less hot, and the upper layers hotter—and consequently the blow gases will pass away at a higher temperature, and carry with them more heat. Thus the efficiency of the blow will be diminished.

Appended is the heat balance for a generator at a mean temperature (t) of 880° C., and a rate of flow (D) of steam = 6. The percentage (a) of carbonic acid in the blow gases for this temperature is 9; and the percentage of carbonic oxide is therefore = (34·7 − 1·65 a) = 19·8. The temperature of the effluent blow gases is 386° C. In the runs the ratio (v) of decomposed to undecomposed steam is = 19·1, and the percentage (c) of carbonic acid in the water gas is = 2·8. The temperature (t_{11}) of the effluent water gas is 440° C.

The blow consumes, with 2·23 cubic metres (78·8 cubic feet) of air—

Kilo.	Pound.		Cubic Metres.	Cubic Feet.		Calories.	B.T.U.
0·120 =	0·265	of C.,	0·223 =	7·88	of CO_2, and evolving	970 =	3850
0·264 =	0·582	yielding	0·492 =	17·35	,, CO, ,, ,,	653 =	2590
The air contains also .			1·760 =	62·20	,, N, ...	..	..
And the 0·384 kilo. of carbon thus yields. .			2·475 =	87·43	,, effluent blow gases and evolves. .	1623 =	6440
At an average specific heat for the blow gases of 0·33 calorie per cubic metre, there is lost at 386° C.						315 =	1250
Leaving, from the combustion of 0·384 kilo. of carbon, a net result of						1308 =	5190

This corresponds with an efficiency for the blow of 42 per cent.

In the succeeding run, 1·7 cubic metres (60 cubic feet) of water gas is formed; and allowing a percentage of 2·8 of carbonic acid in it, the heat required is = 1010 calories = 4010 B. T. U.
At an average specific heat of 0·4, the water gas carries off, at 440° C., = 298 ,, = 1180 ,,

Therefore the total heat used up is = 1308 calories = 5190 B. T. U.
The carbon consumed during the passage of steam for the formation of 1·7 cubic metre (60 cubic feet) of water gas amounts to . . . . . 0·443 kilo. = 0·976 lbs.
The carbon consumed in the blow = 0·384 ,, = 0·847 ,,

The total consumption of carbon = 0·827 kilo. = 1·823 lbs.
The calorific value of 0·827 kilo. of carbon is = 6470 calories = 25,670 B.T.U.
The heat of combustion of water gas, containing 2·8 per cent. of carbonic acid, is 2716 calories per cubic metre, therefore the value of 1·7 cubic metre is = 4620 ,, = 18,320 ,,
The efficiency therefore is 71 per cent., disregarding the heat recoverable in a regenerator.

The heat balance for different temperatures with the rate of flow (D) of steam = 6, is shown graphically in fig. 4.

[The heat of combustion of the water gas has been computed on the assumption that the water gas is free from nitrogen; whereas in practice it always contains a small percentage, which lowers the calorific value per cubic metre, but at the same time increases the volume of gas in the same proportion, so that the ultimate result is the same.]

Appendix.

Calculations adopted in the foregoing paper.

1.—*The percentage* (a) by volume *of carbonic acid in the effluent blow gases*, when t = the mean temperature (in degrees Centigrade) of the generator, was found empirically to be expressed, for temperatures of 600° C. and upwards, by the formula—

$$a = \frac{3730}{t - 467}$$

2.—*The temperature* (t_1) *of the effluent blow gases* is, owing to the cooling effect of the outlet passage, given from pyrometrical readings below its actual value; but theoretical considerations, of which the authors intend to give a special report, show that it is expressed as a function of the length of the blow by the following formula:—

$$t_1 = \frac{K}{[(g\sigma - s) + s e_1]\ e_2^{H e_1 x}}$$

in which

e represents the base of the natural (Napierian) system of logarithms.

x represents a quantity proportional to the time.

H represents a quantity proportional to the depth of the bed of fuel.

g represents the quantity (in cubic metres) of producer gas from 1 kilo. of carbon.

w represents the quantity (in cubic metres) of air for the combustion of 1 kilo. of carbon.

σ represents the specific heat of the producer gas.

s represents the specific heat of the coke.

K represents the heat resulting from the combustion of 1 kilo. of carbon.

The mean temperature (t) of the generator, within the ordinary limits, increases approximately in proportion to the length of the blow, and therefore a quantity x proportional to the temperature t can be inserted in place of the quantity proportional to the time, and then, choosing suitable constants for H and x, a formula entirely conforming with the conditions under consideration is obtained—viz.,

$$t_1 = \frac{2473}{\left(1{\cdot}4436 + \frac{0{\cdot}2}{e^{0{\cdot}0033}}\right) l_2^{\frac{0{\cdot}01}{e^{0{\cdot}0033}}}}$$

The dotted curve in fig. 1 shows graphically the dependence of the temperature of the effluent blow gases on the temperature of the generator. It will be seen therefrom how very slight is the rise of temperature of the effluent blow gases while the uppermost layer of coke remains cold and serves to store heat, and how sudden is the rise as soon as the whole mass of coke is heated throughout. As soon as the temperature throughout the generator is 1710° C., the temperature of the blow gases also becomes 1710° C., and the storage of heat, and thus also the efficiency of the blow, become *nil*.

3.—*The efficiency* (N) *of the blow*, as a percentage, is given by the formula—

$$N = \frac{\text{heat stored up}}{\text{carbon consumed} \times 8080} \times 100.$$

The heat stored up is = the heat evolved less the heat lost. In the authors' first dissertation it was shown that the heat evolved or developed was

$$= \frac{46000 + 2176\,a}{0{\cdot}83\,a + 82{\cdot}6} \text{ calories,}$$

and also that the heat lost was

$$= L \times t \frac{a(0{\cdot}086 + 0{\cdot}000347t) + 30{\cdot}69}{0{\cdot}83a + 82{\cdot}6},$$

and finally that the carbon consumed was

$$= L \times \frac{18{\cdot}6 - 0{\cdot}348a}{0{\cdot}83a + 82{\cdot}6};$$

and hence it follows that

$$N = 100 \frac{46000 + 2176a - t_1\,[a(0{\cdot}086 - 0{\cdot}000347\,t_1) + 30{\cdot}69]}{8080\,(18{\cdot}6 - 0{\cdot}348\,a)}$$

4.—*The ratio* $\frac{\text{decomposed steam}}{\text{undecomposed steam}} = v$, for the rate of flow of steam D is

$$v = 5\,\frac{\tau^2}{D} + \left(\frac{\tau^2}{D} \times \tau^2\right)^5,$$

where $\tau = \frac{t - 700}{100}$; and replacing $\frac{\tau^2}{D}$ by δ, there is obtained the simplified formula:—

$$v = 5\,\delta + (\delta \times \tau^2)^5.$$

5.—*The undecomposed steam* as a percentage (d) of the volume of gas. The gas results from 50 − 0.5 c (decomposed) + d (undecomposed) volumes of steam. The ratio $v = \frac{50 + 0{\cdot}5\,c}{d}$ gives $d = \frac{50 + 0{\cdot}5\,c}{v}$.

6.—*The undecomposed steam* as a percentage (y) of the total volume.

$$y = 100 \times \frac{d}{100 + d} = \frac{100}{\frac{100\ v}{50 + 0{\cdot}5\ c} + 1}.$$

7.—*The temperature* (t_{11}) *of the mixture of gas and steam.* This is dependent on the temperature (t) of the generator and the rate of flow (D) of steam. The following formula shows the best agreement with observations:—

$$t_{11} = 0{\cdot}32\ t\sqrt[4]{D.}$$

8.—*The specific heat* (E) *of the mixture* of gas and steam is given by a formula from the authors' first dissertation—viz.,

$$E = \frac{t_{11}}{1000}\left[(0{\cdot}00348\ c + 0{\cdot}00293\ d)\ t_{11} + 0{\cdot}8\ c + 3{\cdot}38\ d + 306{\cdot}3\right]$$

9.—*The make of gas* (G). As $(50 + 0{\cdot}5\ c + d)$ volumes result from 100 volumes of steam, therefore D volumes of steam give

$$G = D \times \frac{100}{50 + 0{\cdot}5\ c + d}$$ volumes of gas.

10.—*The radiation* $\left(\frac{S}{G}\right)$ *per cubic metre of gas made* is

$$\frac{S}{G} = \frac{S}{D} \times \frac{50 + 0{\cdot}5\ c + d}{100}.$$

Since S depends on the temperature of the generator, and is about proportional to it, it may be replaced by $t \times s$, in which s signifies the radiation per degree (Centigrade) of the mean temperature of the generator. For the generator under investigation, the values were—

$$s = 1{\cdot}2 \text{ and } S = 1{\cdot}2\ t.$$

11.—*Efficiency* (N_1) *of the run.* The heat of combustion (V_1) of the water gas is, according to a formula given in the first dissertation,

$$V_1 = 2808 - 32{\cdot}7\ c.$$

The carbon consumed (C_1) is similarly

$$C_1 = 0{\cdot}537\ \frac{50 - 0{\cdot}5\ c}{100}$$

and the efficiency $N_1 = 100\ \frac{V_1}{8080\ C_1 + A.}$

Now since $A = B + E + \frac{S}{G}$ and the heat of combustion of the carbon in the water gas ($8080\ C_1$) added to the heat of formation (B) of the water gas is equal to the heat of combustion of the water gas, the efficiency of the run may be shown thus—

$$N_1 = \frac{V_1}{V_1 + E + \frac{S}{G}}$$

12.—*The total efficiency* (T) *of blows and runs* is given by the following formula from the first dissertation:—

$$T = 100\ \frac{V_1}{B + E + \frac{S}{G}} \qquad \text{or } T = 100\ \frac{V_1}{8080\ C_1 + 100\ \frac{A}{N}}$$

$$8080\ C_1 + \frac{}{N}\ 100$$

13.—*The heat balance as a percentage of the total heat expended* is

$$8080\ (C_1 + C) = 100\ \frac{V_1}{T}$$

The specific heat of the mixture of gas and steam as a percentage of the total heat expended is then—

$$100\ \frac{E}{100\ \frac{V_1}{T}} = \frac{ET}{V_1}$$

The radiation as a percentage is—

$$100\ \frac{\frac{S}{G}}{100\ \frac{V_1}{T}} = \frac{ST}{GV_1}$$

and the loss of heat ($\times$) through the effluent blow gases, including the unconsumed carbonic oxide, is—

$$100\ \frac{\left(\frac{100}{N} - 1\right) A}{100\ \frac{V_1}{T}} = \left(\frac{100}{N} - 1\right) A\ \frac{T}{V_1}$$

Coal Tar for Boiler Firing.—A coal-tar burner for boilers was described by Mr. H. Russell at the meeting of the Michigan Gas Association. It consists of a piece of 1¼-inch pipe about 18 inches or 2 feet in length, inside which is a piece of ½-inch pipe about a foot long. The tar is delivered to the space outside the small pipe, and the steam is admitted through this pipe, which is stopped some distance within the end of the larger one. In this is fixed an ordinary elbow closed with a cap, and in the latter is cut a slot extending about half way round in circumference, though its size depends on the quality of the tar handled.

MILK-GLASS PHOTOMETERS.

Some types of photometers in which a milk or opal glass plate is used have been recently described by Dr. Anton Kauer in the "Journal für Gasbeleuchtung;" and the following abbreviated description of them is made therefrom.

In fig. 1, there are two right-angled prisms P and p placed opposite the milk-glass plates M and m, and pressed tightly together at their bevelled angles. The rays of light issuing from two sources L and l take the courses L M A B and l m a b. The images of the milk-glass plates, as seen through the eye-piece O, appear as two illuminated fields in juxtaposition. In fig. 2, the sloping mirrors s are placed opposite the prisms, and an opaque screen S, illuminated by the two sources of light L and l, is inserted from the back, so that the rays of light then follow the courses L A B C D and l a b c d. The images are as

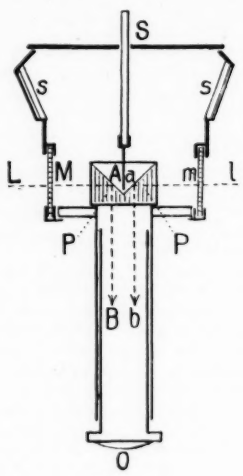


Fig. 1.

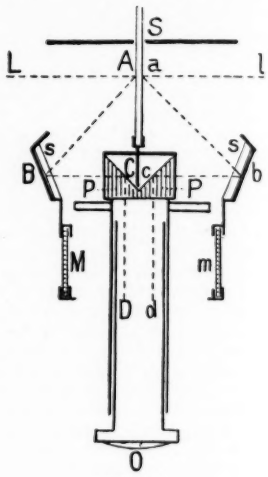


Fig. 2.

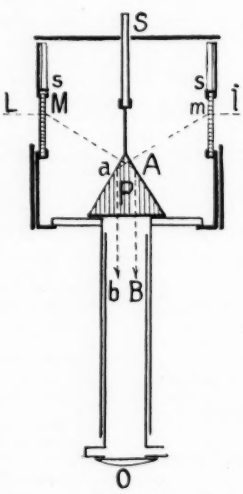


Fig. 3.

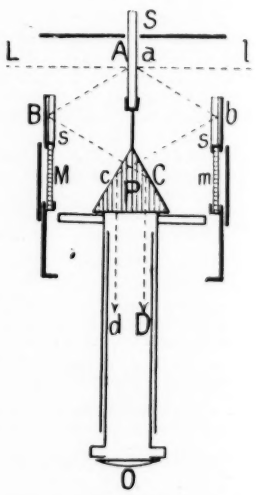


Fig. 4.

with fig. 1. The apparatus may be used as either a mirror or a milk-glass photometer, in the manner indicated in the two figures; and an equilateral reflecting prism may be employed, and the milk-glass plates, M and m, and the mirror s, may be set parallel to the longitudinal axis of the apparatus, as shown in fig. 3. If the milk-glass plates are inserted in the optical axis of the photometer bench, the rays of light take the courses L M A B and l m a b. If, on the other hand, the screen S is put in the optical axis of the bench, L l, then the mirror s comes into operation, and the rays of light take the courses L A B C D and l a b c d shown in fig. 4.

It is possible to grind the prisms so that the angle formed by the two reflecting surfaces is so precise that the line of demarcation of the two illuminated areas is scarcely to be detected. It thus becomes easy to judge their brightness. The arrangement brings under observation the images of the two corresponding sides of the screen S; whereas with the Lummer prism there are observed, on the one side, a central, and, on the other side, a peripheral zone, of the two sides of the screen. The rays of light take shorter courses through glass than in other prism and mirror photometers, and thus suffer less reflection and refraction. In fig. 4, the angle on the screen S is greater than

in other photometers—being 60°. There is for these reasons less loss of light with these forms of photometer. Moreover, they may be easily taken to pieces for cleaning. The apparatus may be reversed—turned about 180°, in both a horizontal and vertical direction.

Each of these types of apparatus may be used for testing according to four different systems—viz.: (1) The transparency process, for which the milk-glass plates are used without mirrors, as shown in figs. 1 and 4. (2) The reflection or dispersion process, in which an opaque screen S, of plaster of Paris or like material, and the mirrors, are used, as shown in figs. 2 and 4. (3) The improved bunsen process, in which the bunsen grease-spot disc takes the place of the screen S (figs. 2 and 4), and images of the two sides of the grease spot are obtained in close juxtaposition. (4) Kauer's new mixing or compensation process, in which a translucent material, such as a thin milk-glass plate, is used as the screen S (figs. 2 and 4). Each of the two illuminated fields appears lighted by the light of one source reflected on one side of the screen S, and by that of the other source transmitted to this side. A mixing of the light thus ensues, which diminishes the contrast of the colours of differently coloured sources to such an extent that, for example, the Welsbach light, the electric arc, and daylight can be quite well compared with, and estimated by, the light of the Hefner lamp or the standard candle, without the use of any auxiliary apparatus.

It is demonstrable that, with this mixing photometer, when the amounts of light reaching the two sides of the screen are equal, the ratio of the intensities of the sources of light is simply dependent on their distances according to the ordinary photometric principle. The smaller the difference between the proportion of the light reflected and the proportion transmitted by the screen the more the mixing colours agree in the two fields of vision; and as this difference is conditioned only by the thickness of the milk-glass plate, it is possible to secure any desired degree of agreement of the colouring. The smaller, however, the difference is made, the smaller is the proporton of the light available for the estimation, and, consequently, the more difficult is the determination of equal intensity. Complete agreement of the colours is impossible with the mixing process.

A petroleum lamp flame tested against the Hefner lamp was found to have the following values according to the mode of testing used: Milk-glass plate, 9·40 Hefners; bunsen disc, 9·30 Hefners; plaster of Paris plate, 9·32 Hefners; and the mixing-plate 9·30 Hefners, A Welsbach light, diminished by a screen with a hole in it, showed a value of 36 Hefners when tested with red and green panes, and of 36·25 Hefners when tested with the mixing-plate. The work of testing and the calculations were less with the mixing-plate.

All the Kauer types of photometer can be reversed, and for choice the reversal is made by turning the apparatus 180° horizontally, as the observer then does not change his position. The arithmetical mean of readings made before and after the reversal is the correct illuminating power. For ordinary use a bar 1 metre in length, with a scale divided into millimetres, is recommended; and when a longer bar is required, the source of light to be tested is placed on a travelling carrier, which can be moved to the required distance in the longitudinal axis of the bar. The distance is then measured by a rule or tape. Such a bar of variable length, and a measuring scale, are preferable to a bar of constant length and an empirical candle scale, for the following reasons: It is well known that in testing lights the laws of photometry are badly strained. Thus the fundamental law that the illuminating power of a source diminishes with the square of the distance is valid only for illuminating points lighting spherical surfaces; but it is commonly applied to lights of large size and plane surfaces. Further, if the source is brought close to the illuminated surface in the photometer, the law that the strength of the illumination is dependent on the sine of the angle of incidence is much strained. The greater the intensity of the sources, the worse the errors become. Thus different values may be assigned to one source of light according as its distance from the photometer disc is altered, especially if one distance is quite small. These evils are overcome, or at least brought to a common measure, if the distance of the standard light from the photometer disc or plate is kept constant.

A methed which may be followed with advantage is to bring the disc or plate to a distance of 25 centimetres (say 10 inches) from the Hefner lamp (or 1-candle standard) and then remove the light which has to be tested to such a distance that the illuminations are equal or nearly so. A slight movement of the disc or observing piece will then give exact equality, and the difference between the angle of incidence for distances of 25 and (say) 24 centimetres is quite negligible. By this plan also the brightness of the field of vision is always approximately the same, and the eye becomes accustomed to recognize deviations from it more easily than when the brightness is continually being altered. It is on this account advisable always to work with a constant distance between the standard light and the disc or illuminated field, whether the light to be tested is powerful or feeble. The distance of 25 centimetres for the Hefner lamp gives an illumination of about 16 metre-hefners; whereas if the distance—*e.g.*, for testing a high-power light—is reduced to (say) 10 centimetres, the illumination becomes 100 metre-hefners, and a change of (say) one metre-hefner could not be readily detected with certainty. The calculations involved in determinations on a photometer in which the distances of the lights are directly measured can be rendered very simple by the aid of tables.

A method for the measurement of diffused artificial lighting or daylight is also described. A petroleum lamp is enclosed in an opaque lantern, and the light therefrom which passes through a circular space 30 millimetres in diameter in two ground glass plates, is used for comparison. This secondary standard is at the outset compared with the Hefner or other standard light, and the height of its flame is kept constant throughout the testings. The lantern is mounted so that it can be moved to and fro before the disc or photometer plate, in order to obtain equality of illumination thereon. If the Hefner or a similar standard were so enclosed and moved, it would be seriously affected by the abnormal conditions; hence the necessity of employing a petroleum lamp having a circular wick and a chimney, as a secondary standard. This plan incidentally also renders any defects in the photometer inoperative; so that all the advantages of reversal are secured.

GAS-WORKS BYE-PRODUCTS AT ST. LOUIS EXHIBITION.

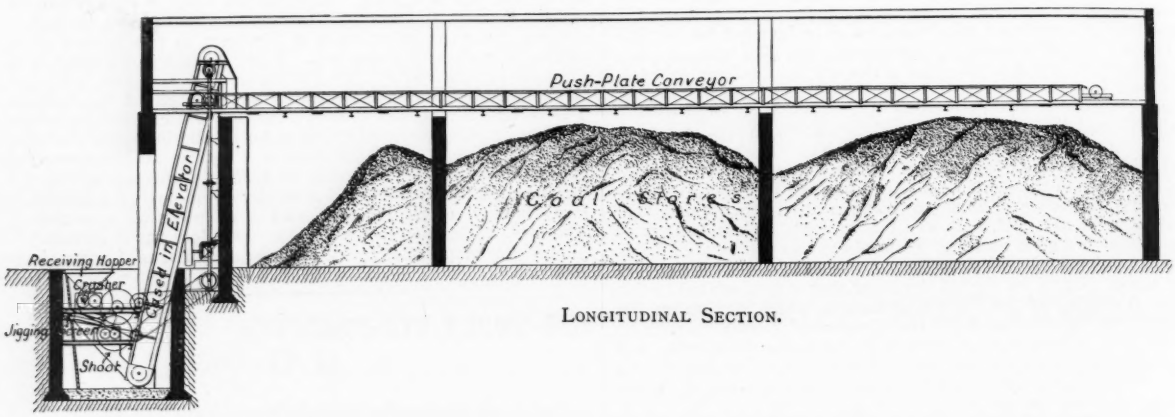
The South Metropolitan Gas Company (says "H. W. J." in the "Co-Partnership Journal"), as the result of an invitation from the British Royal Commission for the exhibition at St. Louis this year, decided to instal a show-case with specimens of the various products manufactured at their tar-works at Greenwich. Attention is naturally attracted to this exhibition by the fact that Sir George Livesey is one of the Royal Commissioners. In compiling and arranging the show-case, we have had constantly before us the object of making the exhibit of the greatest possible educational value to students of technical chemistry and others. Consequently, elaborate and gorgeously-coloured placards do not appear; and the bottles containing our specimens are as plain and unassuming as possible, in order that the interest and attention of the visitor may centre in the products, and not in the vessels containing them. The case in which our exhibit is fitted up is eight-sided, and is divided by eight partitions, which join opposite corners and pass through the centre of the show-case into eight sections, so that each of the eight sides of the case will represent the front of one of the sections. We had allotted to us two sections of the show-case. At the back of one of these sections, we are showing a 25-gallon cask to represent that quantity of coal tar; and on successive shelves appear in order the various crude materials obtained by the supposed distillation of the above 25 gallons. Thus there are shown (roughly speaking), about 1½ gallons of ammoniacal liquor, 1½ pints of crude naphtha, 5½ gallons of creosote, 2½ gallons of anthracene oil, and 1¾ cwt. of pitch. This completes one of the sections. In the other are to be seen specimens of the refined materials obtained from the crude products of the first section; but as some of these occur in such small quantities in coal tar, it was impossible to show them to any advantage in proportion to the amounts existing in 25 gallons. We have therefore exhibited about a pint of each substance. It will no doubt interest readers of the "Co-Partnership Journal" to learn that the Company have been awarded a Gold Medal by the adjudicators.

Local Indebtedness.—A further Blue-Book on the local taxation of the country—the fifth of this year's series—was issued last week. It shows that the unpaid loans of Borough Councils in England and Wales amount to £20,008,889; while the Urban Sanitary Authorities have outstanding loans to the amount of £167,044,757. Taking all the local authorities together, the loans still unpaid total almost £193,500,000. In the last three years, the expenditure of Municipal Councils has increased more than 30 per cent.; while the total of unpaid loans has increased in the same time by £2,500,000.

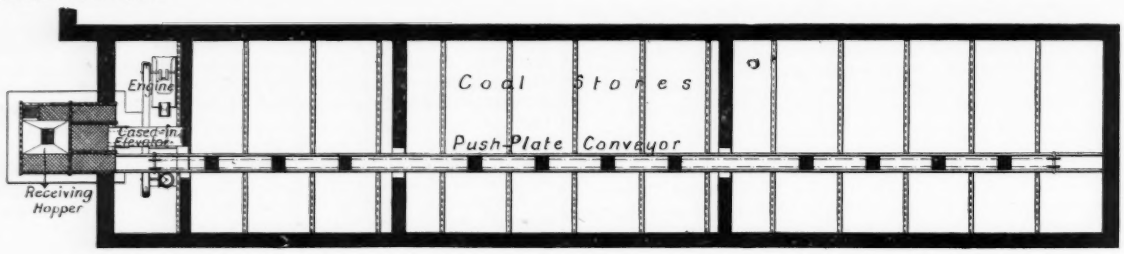
Private Bill Legislation for Next Session.—Last Wednesday was the final day for depositing plans in connection with Private Bills to be promoted in the ensuing session. At the hour for closing the Private Bill Office, 224 such deposits had been made, of which 27 related to railways, 9 to tramways, 128 to Provisional Orders, and 60 to miscellaneous measures. Last year the deposits totalled 272, subdivided as follows: Railways, 27; tramways, 26; miscellaneous, 61; and Provisional Orders, 158. It is noteworthy that the figures of last year showed a decrease upon those of the preceding year, and that a still further falling off is apparent this year.

The Rand Water Arbitration.—The arbitration proceedings between the Rand Water Board and the three existing Water Companies, to which reference has already been made in the "Journal," will be opened shortly. Mr. Walter Hunter, M.Inst. C.E. (of Messrs. Middleton, Hunter, and Duff, Consulting Engineers to the Board), Mr. Henry Rofe, M.Inst.C.E., and Mr. L. Maltby (of Messrs. Deloitte, Dever, and Griffiths) have recently left for Johannesburg to give evidence on behalf of the Board before the Commission which was appointed by the Legislative Council of the Transvaal to determine the amount of compensation to be paid to the Companies for their property.

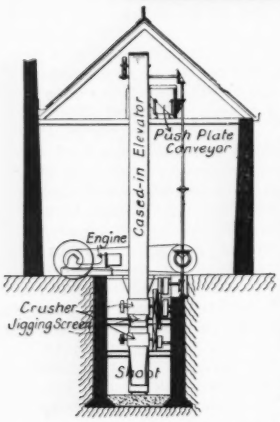
COAL-HANDLING PLANT FOR THE ST. HELIER'S NEW GAS-WORKS.



LONGITUDINAL SECTION.



PLAN.



SECTIONAL ELEVATION OF COAL STORE.

The retort-house of the new gas-works at St. Helier's, together with the plant for working same, was designed by Mr. J. Morris, Engineer to the Company; the contractors being Messrs. Graham, Morton, and Co., of Leeds. The installation has several interesting and novel features to recommend it. It may be mentioned that the contract included the supply and erection of a coal-receiving hopper, a jigging screen, two two-roll crushers, a 24-inch elevator, with 50 feet centres, a 24-inch standard push-plate conveyor, with 142 feet centres, and the whole of the necessary structural work for carrying the plant, as well as the supply of one 40-horse power steam-engine, and the requisite gearing, for driving the installation.

The receiving hopper is built up of $\frac{3}{16}$-inch steel plate, of the usual standard design, 7 ft. 6 in. long by 5 feet wide by 3 ft. 6 in. deep. It is supported on two 6 in. by 3 in. channels built into the walls of the crusher-pit. Beneath the receiving hopper is placed a two-roll crusher for breaking the coal, which subsequently passes over the jigging screen from the larger of the crushers into the second or smaller one, which is an adjusting crusher, similar to the first, except that it reduces the coal into smaller pieces.

The arrangement of the crushers is the outcome of the experience of Mr. Morris, who has had special opportunity for practically testing various designs of crushers. The novel feature of Mr. Morris's crusher is that it is made in two pieces, and so contrived that very large lumps of coal can be crushed without loss of capacity. The larger of the crushers is 4 ft. by 3 ft. by 2 ft. 4 in., built up of $\frac{1}{2}$-inch steel side plates, and $\frac{5}{16}$-inch end plates, and provided with cast-steel rollers. It is supported on 8 in. by 3 in. channels, and on 10 in. by 5 in. rolled steel joists.

The idea of employing two crushers is to obviate the difficulty frequently experienced when the bottom rolls become choked with coal, owing to small coal passing through in large quantities. The top rolls are of cast steel, 2 ft. 8 in. diameter, and are of the claw type. They are mounted on 6-inch square shafts, revolving in massive cast-iron brackets, bushed with white metal. The size of coal with which the crusher is capable of dealing is about 2 ft. 6 in. cube.

Immediately under the crusher is arranged a small screen feeder—*i.e.*, jigging screen—which allows all the small coal to pass through the bars, and delivers the same by means of a bye-pass shoot to the elevator boot. Thence it is carried by the elevator (to which further reference will be made) to the top of the coal-stores, being then delivered on to a 24-inch push-plate conveyor, running the full length of the interior of the coal-stores, whence it is distributed by eleven sliding doors on to the floor of the store, passing from there as required to the retort-house. All the coal which is too large to pass the screen-bars is delivered into the secondary crusher, to be crushed to the requisite size. This crusher is similar in design and construction to the primary one. It is 3 ft. 9 in. by 3 ft. 2 in., and is supported on 8 in. by $3\frac{1}{2}$ in. channels, and 10 in. by 5 in. rolled steel joists. It differs from the larger crusher in that one set of rolls is adjustable, so that any size of coal can be made.

The jigging screen, which is immediately under the primary crusher, is driven from a shaft by eccentrics, and is 4 ft. 6 in. long by 2 ft. $7\frac{1}{2}$ in. wide by 9 inches deep, built of steel plates and angles. The screen is of the flat-bar type; the bars being bolted together to form the sieve, and arranged to afford facility of access. This screen is supported on two 6 in. by 3 in. steel channels. The crusher-pit is covered in by means of $\frac{5}{16}$-in. chequer-plates; and a ladder is provided for the convenience of getting easily to the pit.

The elevator is of the cased-in type; the boot being of cast iron and the body of the elevator built up of angle runners and cased-in with steel plate. The capacity of the elevator is 50 tons of coal per hour. The elevator-head is carried by means of 6 in. by 3 in. channels; and these, as already stated, are built into the wall of the coal-store at one end, and supported on beams at the other. The shoot from the elevator-head is constructed of $\frac{3}{16}$-in. plate, and connected to the push-plate conveyor. The buckets are of stamped steel, 24 inches wide, attached to two strands of 6-inch pitch chain, and fixed at every fourth link.

The push-plate conveyor is built up of 6 in. by $2\frac{1}{2}$ in. and 3 in. by 3 in. angle-iron runners, firmly braced together by means of angle irons and flat bars. The push-plates are pitched every 2 feet, and are attached to two strands of 6-inch pitch chain. The bottom of the trough is formed of $\frac{1}{4}$-inch plate, fixed to 6 in. by $2\frac{1}{2}$ in. channels. The conveyor is supported on 10 in. by $4\frac{1}{2}$ in. rolled-steel joists, 24 ft. 3 in. above the floor level. The driving and trailing ends are built of 4 in. by $2\frac{1}{2}$ in. channels, placed in position back to back, supported on 6 in. by 3 in. channels, and fitted with the necessary shafts and drums.

The whole of the plant is driven by one 40 brake horse power steam-engine, which leaves a considerable surplus of power. The drive is by means of a belt on to a cross shaft, from which the power is taken to drive the crushers and screen by means of additional belts; while for driving the elevator and conveyor, it is carried *via* bevel wheels to a vertical shaft.

Cost of Technical Education.—According to a recently-issued Blue-Book, the total amount expended on technical education in England and Wales during the year 1902-3 was £1,191,998. This amount is exclusive of the sums allocated to intermediate and technical education under the Welsh Intermediate Education Act, 1889. The amount raised by loan on the security of the local rate under the Technical Instruction Acts was £149,665; the amount of loans so raised outstanding was £1,159,941; and the balance in hand of moneys received and allocated to technical instruction was £598,989.

COAL-CONVEYING PLANT ABROAD.

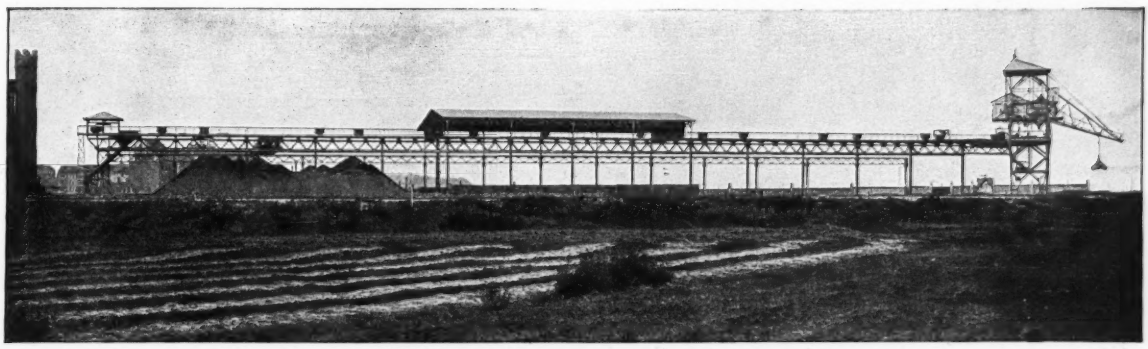


FIG. 1.—COAL LANDING AND CONVEYING PLANT AT THE RIXDORF GAS-WORKS.

The "Journal für Gasbeleuchtung" has recently published an account of coal-conveying plant lately installed at some Continental gas-works by the Berlin Anhalt Engineering Company. We are able, through the courtesy of our contemporary, to reproduce the illustrations of this plant, of which a brief description is appended.

In the account of the new gas-works at Rixdorf, near Berlin, which was given in the "JOURNAL" for Aug. 9 (p. 387), reference was made to the arrangements for raising the coal from the barges arriving at the canal wharf, and for conveying it to the coal-stores on the works. A general view of the landing and conveying plant is giving in fig. 1; and fig. 2 is a detailed illustration of the landing tower. This tower travels on a fixed framing, and picks up the coal from the barges by means of grabs, which raise it to the level of the tower and discharge it into a funnel-shaped receiver capable of holding five grab loads. The coal is taken from this receiver by a haulage line, which automatically distributes it throughout the storage grounds. The waggons on this line are constructed to discharge automatically. They have sloping bottoms, and a striker which effects the discharge when it hits the tappet, which is raised at whatever point in the line the coal is to be tipped. Some waggons on this haulage line are shown in fig. 3, at the right hand side of which is the apparatus that automatically couples the waggons to the haulage rope. There is a check or block device for preventing two waggons being taken up on the same section; so that collisions are thus avoided. In order to be able to empty the waggons over the whole width of the storage ground, a travelling bridge, shown in fig. 4, is provided, with a conveying band on to which the coal

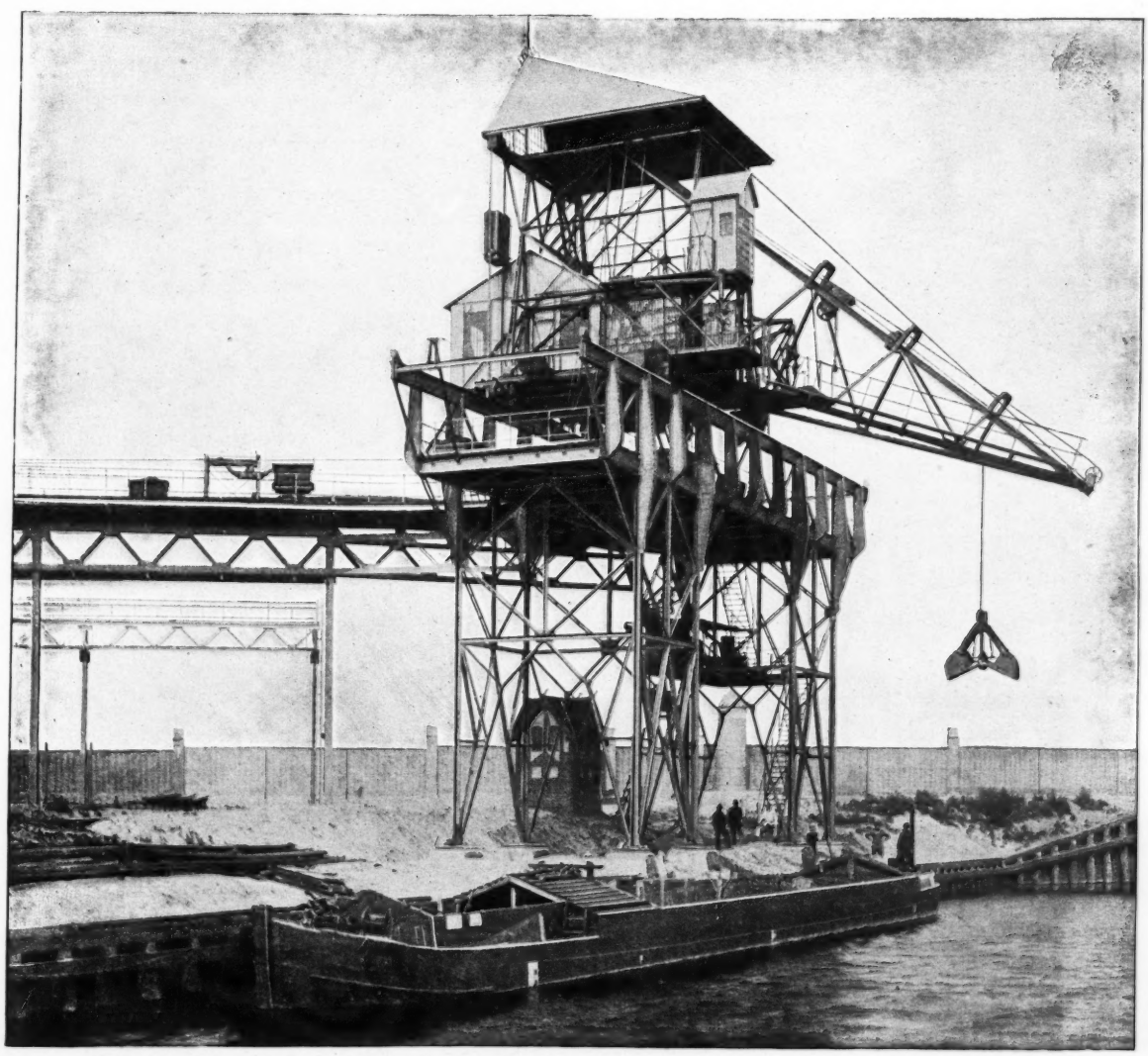


FIG. 2.—DETAIL OF THE LANDING TOWER.

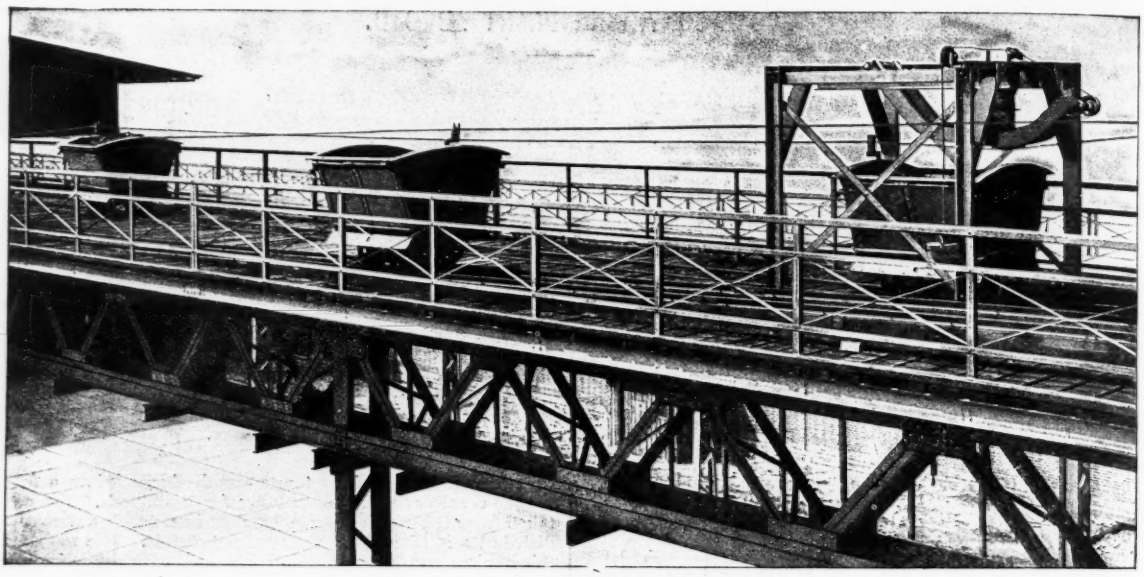


FIG 3.—THE COUPLING ARRANGEMENTS ON THE HAULAGE ROPE.

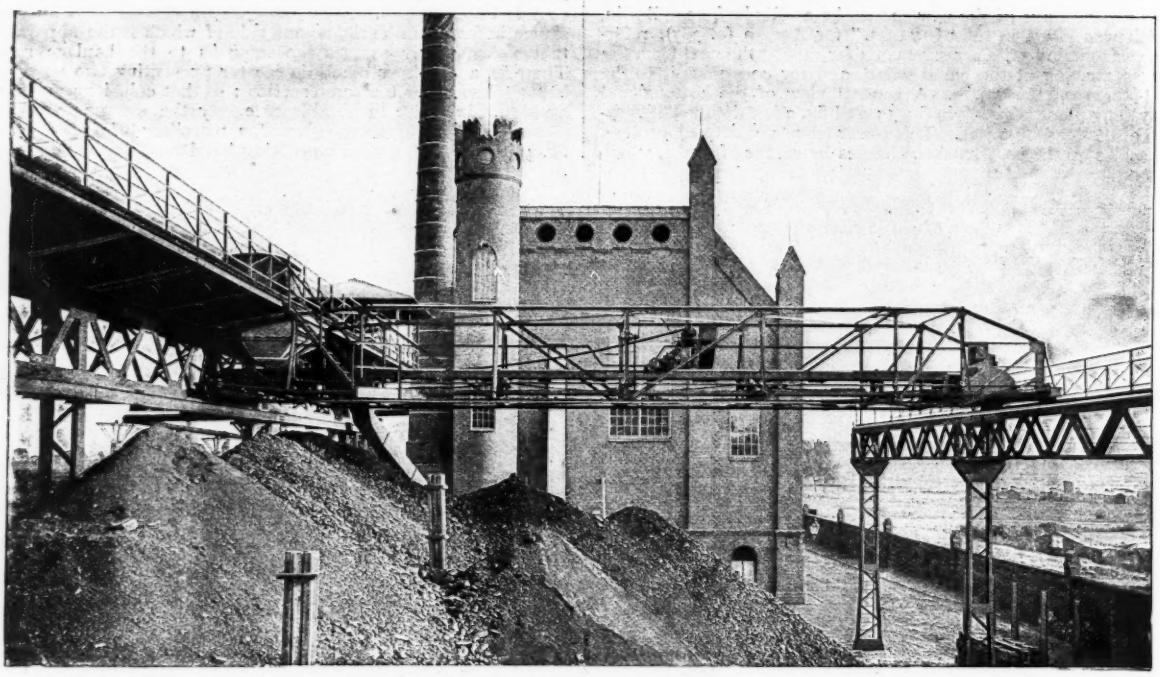


FIG. 4.—THE TRAVELLING BRIDGE OVER THE COKE STORAGE YARD.

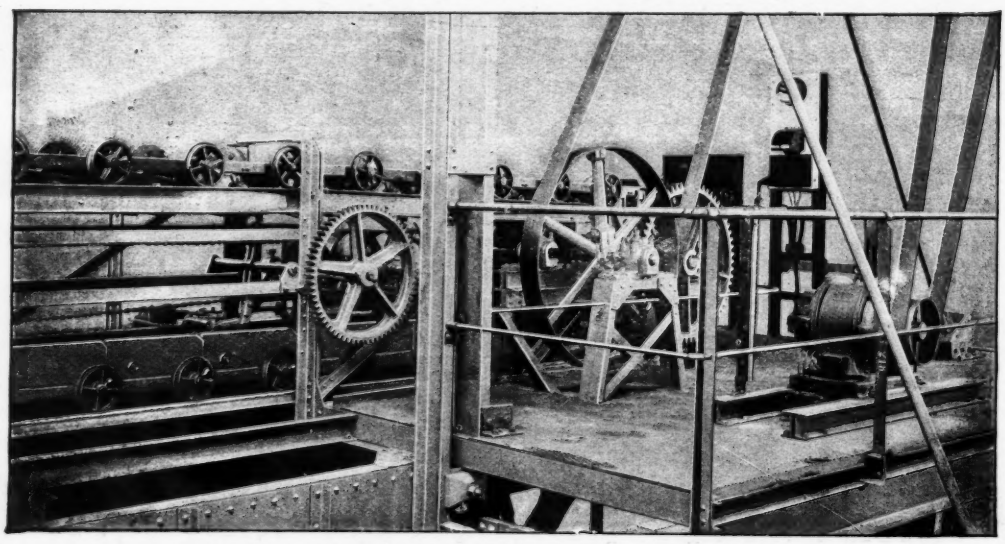


FIG. 5.—TROUGH CONVEYOR (WITH AUTOMATIC TIPPING ARRANGEMENT) AT THE NUREMBERG GAS-WORKS.

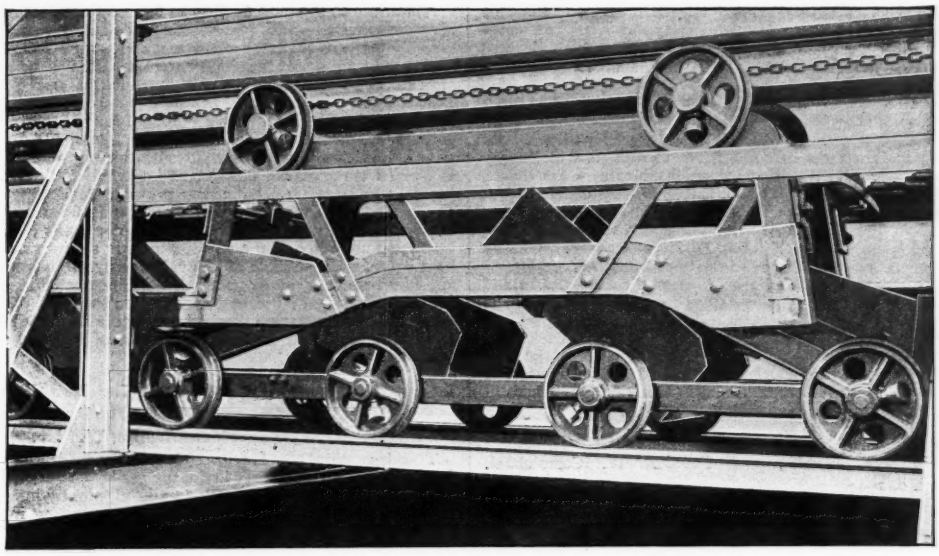


FIG. 6.—THE TIP-UP DISCHARGING TROLLEYS.

is discharged through a funnel from the waggons on the haulage line. If the coal has to be transferred direct from the barge to the retort-house, the waggons are tipped at the end of the viaduct, so that the coal runs down a shoot to the coal-breaker, into which coal may also be brought from the storage ground. The broken coal is raised by an elevator which conveys it into the retort-house. The entire conveying plant at Rixdorf is designed for dealing with a coal consumption of 30 tons per hour. The coal is weighed on an automatic machine at the beginning of the haulage line.

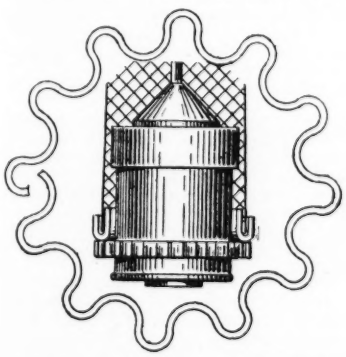
Conveying plant has also been installed at the new gas-works at Nuremberg. There is a trough or box conveyor shown in fig. 5 which has certain advantages. Like earlier rake or scraper conveyors, it does not entail much attention, as the coal is automatically carried on as soon as a bunker is filled. But this conveyor, which is provided with an automatic overturning arrangement as shown, has the advantage of bringing the coal without rough usage to the point of discharge, and of avoiding the grinding action of the scraper trough conveyors. It consists of a number of troughs or open-ended boxes which fit together; and it has lateral guide rollers which run up the guide rails on a discharging trolly when the troughs are tipped up by the latter. They then take the positions shown in fig. 6. The discharging trolly is moved to and fro at a moderate speed by means of a driving sheave and a chain or rope. Pegs on the chain, or little bells on the rope, set at the end of the conveyor at the distance apart which corresponds to the length over which the coal is to be discharged enable the discharge to be effected over the desired space without further control. Thus the necessary attendance is reduced to a minimum.

REGISTER OF PATENTS.

Self-Acting Igniters for Gas-Burners.—Kellermann, J., of Berlin. No. 27,681; Dec. 17, 1903.

This invention has reference to a device intended to protect the igniting body against "rapid destruction" by enclosing it in a conically shaped casing pervious to the gas, whereby only a small fraction of the gas and air mixture (sufficient for ignition) is admitted to the ignition body: while the greater part of the gas, and also the gases of combustion, are deflected sideways, so that they are prevented from injuriously acting upon the igniting body. The arrangement referred to is being shown at the Earl's Court Exhibition, and was described in the "JOURNAL" for the 22nd ult., p. 594.

Anti-Vibrator for Incandescent Mantles.—Jarman, T., and Dodson, L., of Swindon. No. 27,952; Dec. 21, 1903.

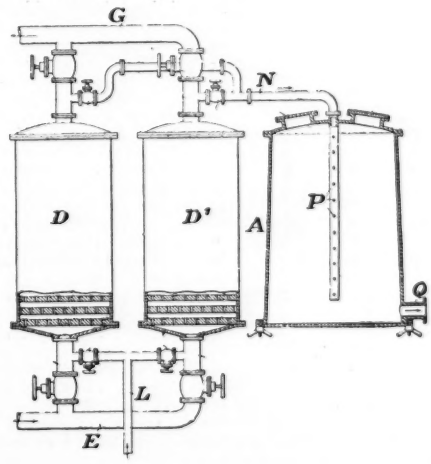


This combined support and anti-vibrator for incandescent gas-mantles consists of a ring of asbestos or other incombustible material, having double walls, as shown. The bottom edge of the mantle slides down between the walls; the bottom of the ring being held in a gallery, adjustable on the burner, over which it slides. It is then fixed in a suitable position, according to the length of the mantle, by a set-screw or other means.

Manufacture of Combustible Gas.—Bowing, J., of Tilbury. No. 28,498; Dec. 28, 1903.

This invention relates to the manufacture of a mixture of hydrogen and carbon monoxide (water gas). The present mode of introducing oxygen to the generator and raising the temperature of the charge operated on (involving as it does the introduction of a comparatively large proportion of nitrogen) is dispensed with, in this way: Steam is raised in a boiler at a pressure preferably somewhat in excess of that at which it is desired to be used in the retort. From the boiler, it is led into a superheater, which is in the form of a coil or other recuperative chamber of refractory material. The steam therein is highly superheated and expanded, so that it passes with considerable velocity out of the superheater into the retort. Good results are said to be obtained by heating the charge in this way to a temperature of 700° C.

A is the "retort" in which the generation of gases takes place. It is of any suitable shape in horizontal section, and preferably provided with tapering or inclined sides and with a removable bottom, so as to permit of readily discharging the contents when desired. In practice, the retort will usually be provided with a fire-brick or other refractory lining. At the top are doors or covers, the removal of which permits the introducing of carbonaceous material into the retort. D D¹ are the steam superheating chambers. These heat regenerators consist of metal shells or casings filled with honeycomb bricks adapted to be heated either by the combustion of gas within the chambers or by



passing furnace gases directly through them. Each chamber is connected to a pipe E below and with a discharge or flue pipe G above. Valves are provided for controlling communication between the superheating chambers and the discharge pipe.

A single pipe N, having in it a series of perforations P, projects down into a chamber A to near the bottom; but, if desired, the pipe N may have a series of pipes connected to it so as to distribute the superheated steam through the mass in the chamber more evenly than would be the

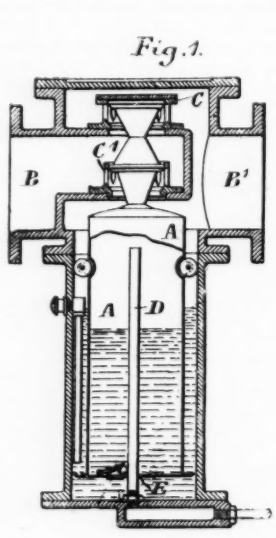
case with a single pipe. The total area of the perforations in the pipe hould, however, as nearly as possible correspond with the cross sectional area of the pipe N. Q is the pipe through which the gas produced is discharged to the purifying apparatus or to the points where it is required for use or is to be stored.

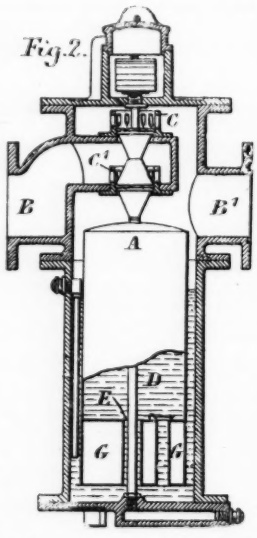
The operation of the apparatus is as follows: Assuming the brick filling in the superheating chamber D has been heated by the combustion of gas therein (the right valves having been opened to admit gas and to allow the products of combustion to escape, while other valves have been closed) to the required extent, steam, which enters through the pipe L, passes through the chamber D, where it is superheated, and thence flows through the pipe N, and the perforations therein, into the chamber A. While this operation is taking place, the heating of the material in the chamber D^1 is proceeding. On the material in D becoming cooled to such an extent that it will no longer serve for superheating the steam, the heating of the material in the chamber D^1 is discontinued, and the valves in connection with the chamber D are closed; so that the steam to be superheated passes into the chamber D^1, and thence enters the retort A. When the material in the chamber D^1 has become cool, the same operation is repeated, and so on. Fresh carbonaceous material is introduced into the retort A from time to time as the operation proceeds, so that the apparatus can work practically continuously.

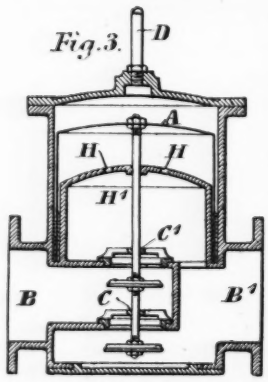
Gas-Governors.—Grieve, G. K., and Peebles, W. Carmichael. No. 403; Jan. 7, 1904.

This invention relates to gas-governors having a controlling bell working in a liquid seal, either of water or mercury, and principally intended for use where it is desired to reduce a high, and may be fluctuating, inlet pressure to a lower and constant outlet pressure.

In fig. 1, there is combined with a controlling bell A a double-beat balanced valve which controls the passage of the gas from the inlet B to the outlet B^1 of a valve box. This valve consists, preferably, of two cones joined together at their apices—the bases forming the valves, and closing against valve seats; a third cone connecting the valve to the bell A. The seats (or, it may be, only one of them) are made with cylindrical extensions C C^1, to act as guides for the valves; openings being







formed through the guides to permit the gas to pass from the inlet to the outlet when the valve is open as shown. The coned valve spindle extends downwards to the controlling bell, working in its liquid seal in a chamber on the under side of the valve-box; the depth of the liquid being regulated by an overflow pipe. This chamber is on the outlet side of the governor; so that the pressure of the gas, on that side only, can act on the top of the bell. Thus, "although the inlet pressure may be considerably higher than is now generally practised in gas distribution, a secure seal can be obtained with a comparatively shallow bell."

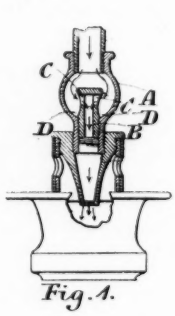
Adjustment of the governor to give the required outlet pressure is accomplished by means of air pressure acting on the under side of the bell A; the air being led from a separate pressure holder (not shown) through a central pipe D projecting up into the interior of the bell A. The bottom of the bell is closed by a baffle-plate, having an aperture (or apertures) in it fitted with a non-return valve (or valves), or the valve may be fitted in the side of the bell above the baffle-plate. If the pressure suddenly increases, oscillations of the bell A, and, consequently, pulsations in the flow of gas, are checked, as, when the sealing liquid is acted on by the impulse of the excess pressure, it lifts the valve and surges through the opening into the interior of the bell. Its equally sudden return is, however, prevented by the valve, and it can only find its way back to the chamber slowly through a comparatively small opening E, around the central pipe.

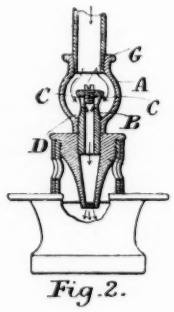
According to the modification in fig. 2, adjustment of the governor to give the required outlet pressure is made by means of weights, acting directly (or it might be through a lever) on the bell A; the weight of the bell being partly or wholly counterbalanced by means of a float G formed in the under part of the bell. Communication is made between the interior of the bell and the atmosphere by means of the central stand pipe D; the lower end of the pipe communicating with a chamber, the outer end of which is preferably fitted with a perforated plug. A passage (or passages) fitted with a non-return valve (or valves) is formed through the float G, and a small opening E surrounds the central standpipe; so that if the pressure suddenly increases, oscillation of the bell is effectually prevented, as in fig. 1.

In fig. 3, a mercurial seal is used; the controlling bell A and the seal being arranged above the valve, which is shown as a simple double-beat valve. The spindle of the valve passes up through guides C C^1, and is connected directly to the bell. The outlet pressure is admitted to the under side of the bell through holes H in the dome, forming part of the mercury chamber. Loading of the bell is effected by means of air pressure admitted to the upper side of the bell by a pipe D.

Inverted Incandescent Gas-Lamps.—The New Inverted Incandescent Gas-Lamp Company, Limited, of Farringdon Avenue, E.C., and Bennett, C. S., of Hammersmith, W. No. 779; Jan. 12, 1904.

This invention has for its object to prevent dust, dirt, or other foreign matter, which may be in the gas-supply pipe, passing into the burner and choking the holes in the nipple, by interposing between the gas-supply pipe and the burner, or inserting in the gas-pipe, a device so arranged that, while allowing the gas to pass freely through to the burner, will arrest and retain any foreign matter which may be carried along by the gas or fall down the gas-pipe. The invention, broadly speaking, consists of a receptacle or chamber into which projects a hollow plug or tube closed at its upper end or top and provided beneath the closed end or top with lateral orifices for admitting the gas from the supply pipe to the burner. The hollow plug is so arranged as to leave between itself and the interior of the receptacle a space within which the dirt that may enter the receptacle will be arrested and so prevented from passing to the burner or burners. Or the device may be such that the hollow plug or tube may be inverted and arranged to receive and arrest the dust.





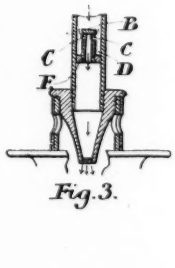


Fig. 1 is a vertical section of one form of the dust-arresting device, showing it applied to an inverted incandescent gas-lamp and interposed between the gas-supply pipe and the burner. Fig. 2 is a modification, provided with means for regulating the quantity of gas passing to the burner. Fig. 3 is an alternative arrangement of the dust-arresting device, in which the gas supply pipe itself constitutes the receptacle or chamber.

In figs. 1 and 2, A is the receptacle or chamber which is attached, at its upper end, to the gas-supply pipe, and carries at its lower end the hollow plug or tube B. This projects, to a suitable distance, into the receptacle, and is closed at its top. Just beneath the top it is furnished with lateral orifices C, which allow passage of the gas, through the usual nozzle, from the supply pipe to the burner, as shown by the arrows. By this construction and arrangement, there is left between the hollow plug or tube B and the interior of the receptacle A, an annular space D, into which any dirt that may be carried along by the gas will be received and arrested; while, owing to the disposition of the lateral orifices C, it will be impossible for any particles of dust to enter the burner.

In fig. 3, the gas-supply pipe constitutes the receptacle or chamber A; and within this pipe the hollow plug or tube B, which is likewise formed with a closed top and lateral gas inlet orifices beneath it (as in the previous arrangements), is arranged. The plug is here maintained in position in the gas-supply pipe by means of a plate or disc E, into which it is screwed, and through which it projects upwardly to the requisite distance. The annular space D, for the reception of dust, is here constituted between the plug B and the inner wall of the pipe.

Incandescent Gas-Lighting.—Scott-Snell, C., and the Scott-Snell Phillips Syndicate, Limited, of Victoria Street, S.W. No. 13,670; June 16, 1904.

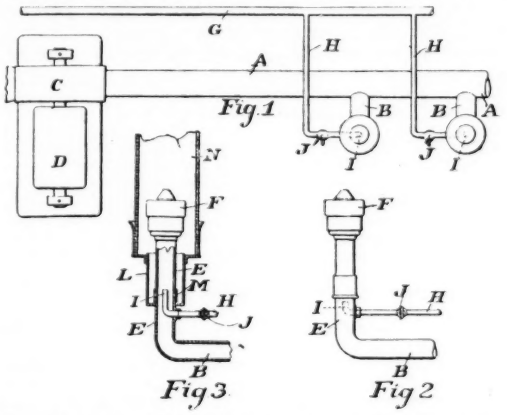
The invention relates to intensified gas lighting; and the object aimed at is "to obtain this intensive gas lighting with simpler means than have hitherto been employed."

The proposed system of gas combustion comprises a number of burners, each supplied with gas and air under a relatively small pressure through a comparatively large conduit of small resistance; the air supply being obtained conveniently from a fan driven by (preferably) an electric motor. The several branches from the conduit connecting to the burners are also of large bore, and arranged without taps or the like; so that the resistance of the conduit and its branches is practically the same, whether the burners are in use or not.

Fig. 1 is a diagrammatic plan of one modification of the system. Figs. 2 and 3 are elevations showing diagrammatically two arrangements of the burners.

In fig. 1 there is provided a large main A, capable of passing air to supply a series of burners under small pressure—1-10th to 1-50th inch of water. On the other end of the main is a fan C, preferably working in a ring or hood and driven by a small electric motor D. On the air-trunk are attached the various branches B, carrying the burners. These branches are also of relatively large bore. A gas-service pipe G is also arranged with branches H supplying a gas-jet I at each burner.

There is a moderate length of pipe E, fig. 2, which will act as a mixing-tube for the burner-head F, which is arranged with a non-



lighting back top, and made with passages of sufficient capacity to offer no substantial resistance to the air supply. The fan is thus able to supply a considerable number of burners, "as the energy it is required to give out for even a large air supply is relatively small." No cocks are provided on the air branches, but the lights are put out by turning off the gas at the cocks J—the air supply blowing into the atmosphere when the burner is not lighted, except when all the lights are extinguished, in which case the fan is stopped.

Where the lights have to stand draughts, or burn in a foul atmosphere, the burner-tube E (fig. 3) is surrounded with an additional tube L, adapted to carry at its head an open-topped globe N. This outer tube is jointed to the globe so that the external atmosphere is not admitted; and the supply of air from the trunk, in addition to passing up through the burner-tube E, passes also through the holes M in the bottom of the tube and up between the tubes, and delivers a certain amount of air into the space within the globe surrounding the mantle. "The globe has thus always a certain amount of outflow, which renders the lantern practically draught proof."

Pulverulent Product for Coating and Joining Retorts and the Like.—Muller, L. E., of Paris. No. 15,057; July 5, 1904. Date claimed under International Convention, July 8, 1903.

This invention relates to the preparation and application of a pulverulent product, called "carborundociment" [which indicates that carborundum forms its base], designed to immediately form, by mixture in water, grouts, or plasterings, suitable for spreading over the surface of materials entering into the construction of furnaces, pipes, retorts, or vessels or over coverings of any kind with the object of protecting them from the action of fire, hot gases, and contact of acid and generally corrosive materials. In manufacturing the product various substances are added to the silicide of carbon or carbide of silicium, the choice of which will depend upon the application of the product or the nature of the destructive effects it is intended to prevent.

If it is designed to coat the walls of furnaces, with the object of preserving the brickwork used in their construction, the mixture will be composed as follows:—

Silicide of carbon	90 to 60 parts.
Refractory clay	10 to 40 ,,
Lime	0 to 4 ,,
Silicate of soda or potash at 47° B	20 to 50 ,,

These substances, intimately mixed and finely ground, are dried and then again ground to do away with any agglomeration which may result from the drying. To employ the powder, it is only necessary to mix it in water in the required proportion in order to obtain, according to requirements, a kind of liquid or semi-liquid paint, or a mortar or cement.

In cases where it is required to resist or prevent chemical action, other mixtures with varying proportions within certain limits (such as the following composition) may be employed:—

Silicide of carbon	50 to 85 parts.
Decarbonated calcined magnesia	5 to 15 ,,
Fine sand	10 to 25 ,,

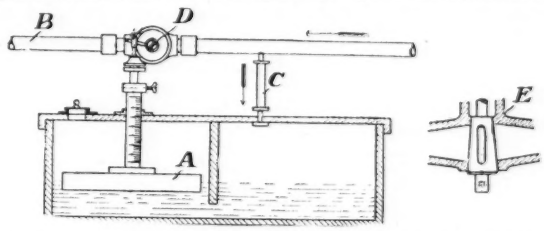
These materials are also very finely ground, and the mixture obtained is moistened with saturated chloride of magnesium.

The nature of the substances mixed with carborundum, as well as the nature of the moistening liquid, are different in the two cases, because they have to depend on the physical or chemical action to be resisted and on the reaction which will be brought about in fixing the coating on the materials to be protected. Thus, in example No. 1, the carborundociment only requires pure water for mixing it, as the fire completes the reaction by causing the silicate to melt and bring the coating into a condition of a uniform protecting glaze. In example No. 2, on the contrary, the action of fire for the final fixing is not required; the re-action of the chloride of magnesium on the magnesia directly effecting the hardening and consequently the fixing.

Gas Pressure Regulators.—Burri, R., of Zurich, Switzerland. No. 18,328; Aug. 24, 1904.

This invention relates to a device for equalizing the flow of gas in pipes, and comprises a regulating-cock, controlling the gas-pipe, and opened and closed by a float, the rod of which is connected with the regulating-cock by a very short lever. A narrow, elongated gas-passage is provided in the cock-plug; so that, firstly, very minute movements of the float are transmitted to the cock, and, secondly, the gas-passage is very essentially increased and decreased.

The float chamber is divided into two compartments by a partition, which, however, does not extend wholly to the bottom, but allows the liquid to flow below it. In one of the compartments A is the float, the tubular stem of which projects through the cover of the chamber, and is provided with a scale. A sliding connecting-rod and a screw retain



the rod at any suitable height. There is a small closable aperture in the cover of the chamber, for purposes of filling and inspection. B is the gas-pipe, connected to the second compartment of the chamber by a branch-pipe C. Behind the pipe the regulating-cock D is inserted. This cock is connected with the float by means of a short lever, rod, and stem. The one end of the lever is rigidly secured to the spigot or plug of the cock, while the other lies loosely in an eye or lug at the head of the float rod. The plug is slotted at E, so as to present a narrow gas-way or passage.

The regulator acts the same as other devices of its kind. The essential features of it are: The short lever by means of which the smallest motions of the float A are transmitted to the plug, and the narrow gas-passage or opening whereby, on turning the plug, the passage is very considerably opened or closed, so that the most minute variations of pressure are equalized.

APPLICATIONS FOR LETTERS PATENT.

24,636.—Kent-Johnston, A. G., "Lighting and extinguishing street and other lamps." Nov. 14.
24,653.—Ogilvie, R. C. F., "Meter." Nov. 14.
24,660.—Walker, G. A., "Gas-fittings." Nov. 14.
24,694.—Nusch, F., "Incandescent light mantles." A communication from G. Mortimer-Sterling. Nov. 14.
24,715.—Lea, J. W., and Perrins, J. H., "Incandescent gas-lamps." Nov. 15.
24,732.—Kay, M., "Inverted lamps." Nov. 15.
24,783.—Testor, F., "Automatic gas-lighter." Nov. 15.
24,785.—Wilton, G. & T., "Furnaces." Nov. 15.
24,787.—Spencer, F., "Regenerative furnaces." Nov. 15.
24,826.—Mavor, H. A., "Gas-furnaces." Nov. 16.
24,832.—Thorp, T., "Rotary meters." Nov. 16.
24,867.—Hutch, I. M'C., and Joel, H. F., "Mantle supports." Nov. 16.
24,872.—Cuttell, T. L., and the Anti-Vibration Incandescent Lighting Company, Ltd., "Gas and like fluid meters." Nov. 16.
24,903.—Capell, G. M., "Washing gas." Nov. 16.
24,909.—Lawton, R., "Pipe-joints." Nov. 16.
24,961.—M'Donald, A., "Gas-meters." Nov. 17.
24,965.—Grunfeld, F. S., "Cocks for gas igniting and extinguishing devices." Nov. 17.
24,975.—Bennet, J. H., "Apparatus for comparing the illuminating effects or consumption of gas-burners." Nov. 17.
24,986.—Sugg, W. T., "Pressing gas." Nov. 17.
25,036.—Liais, L., "Inverted lamps." Nov. 18.
25,045.—Baldry, G. H., "Gas-stoves." Nov. 18.
25,050.—Townsend, H., "Dip-pipes." Nov. 18.
25,080.—Kay, M., "Inverted lamps." Nov. 18.
25,113.—Beale, B. R., "Coin-freed meters." Nov. 18.
25,138.—Hilson, A., and Wilton, A. J., "Retort-lids." Nov. 18.
25,157.—Seal, J. W., "Two-cycle internal combustion engines." Nov. 19.
25,160.—Bennis, A. W., "Coke conveyors." Nov. 19.
25,164.—Storey, A. W., "Coal conveyor belts." Nov. 19.
25,185.—Salzenberg, E., "High-pressure light." Nov. 19.
25,255.—Gesellschaft für Farbenfabrikation m.b. H. and Rosenberg, A., "Gas-lighter." Nov. 21.
25,278.—Graham, M., "Gravity bucket conveyors." Nov. 21.
25,293.—Wildschiödtz, C. C., "Lighting and extinguishing gas at fixed times." Nov. 21.
25,299.—Volz, W. G., "Water-meters." Nov. 21.
25,404.—Marconnet, G., "Producing gas." Nov. 22.
25,420.—Stott, J., "Gas-governors." Nov. 22.
25,455.—Pegden, H. F., "Incandescent burners." Nov. 23.
25,513.—Sugg, W. T., "Outdoor shop lamps." Nov. 23.
25,523.—Whimster, J. W., "Lighting or extinguishing a number of lamps simultaneously." Nov. 23.
25,559.—Little, G. & M. C., "Conveyors and elevators." Nov. 24.
25,581.—Lomas, T. P., and Barbut, W., "Gas grilling or cooking apparatus." Nov. 24.
25,657.—Pollard, R. S., and Longstaff, R. W., "Four-way valve." Nov. 25.
25,675.—Huffam, C., "Gas-turbine." Nov. 25.
25,782.—West, W. W., and Dixon, T. H. L., "Joints for pipes." Nov. 26.
25,791.—Altman, J., "Supporting globes." Nov. 26.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Improved Arrangement of Carbonizing Plant.

SIR,—In your last issue, I had the pleasure of reading an article under the above heading, which reminded me of the early history of the introduction of inclined retorts into this country. It will be interesting to your readers to know that similar systems and designs to that shown (with producers underneath the charging-floor, and fed from the same) were erected in several gas-works from 1889 to 1896, including the following: Middlesbrough, Hartlepool, Huddersfield, Oxford, &c. Full descriptions and illustrations of these plants appeared in the "JOURNAL" at the time.

MAURICE GRAHAM.

Leeds, Dec. 1, 1904.

Ammonia Stills at the Gas Exhibition.

SIR,—Referring to Mr. Pettigrew's letter in your last issue (p. 707), regarding your remarks on our improved trays for sulphate stills, we would suggest that Mr. Pettigrew should send to the Gas Exhibition one of his trays, which he says he has been supplying for the last eleven years. We shall be pleased to offer him space to exhibit it alongside our own tray, for the purpose of comparison.

BIGGS, WALL, AND CO.

13, *Cross Street, E.C., Dec.* 1, 1904.

PARLIAMENTARY INTELLIGENCE.

PROVISIONAL ORDER APPLICATIONS (SESSION 1905).

The following additional notices of intended applications to the Board of Trade for Provisional Orders under the Gas and Water Works Facilities Act, 1870, appeared in the "London Gazette" last Tuesday.

Hayling Water.—The Hayling Water Company, Limited, will apply for authority to raise additional capital and to open private streets for the purpose of laying mains.

Worthing Gas.—The Worthing Gas Company will seek power to acquire, hold, and dispose of lands, manufacture and store gas and residual products, and provide dwelling-houses for their employees.

Ystalyfera Gas.—Application will be made by Mr. John Newton, of Ystradgynlais, in the county of Brecknock, trading under the name of the Ystalyfera Gas Company, for authority to maintain and continue the existing works, manufacture and store gas, and supply it in the parishes of Llanguicke and Cilybebyll (or Killybebill), in the county of Glamorgan, and in the parishes of Ystradgynlais Higher and Lower, in the county of Brecknock. He will ask for the usual powers in regard to opening roads, laying mains, and levying rates and charges, as well as sanction to the raising of additional capital.

Leeds Gas Workers and the Unemployed.—The Leeds gas workers have not seen their way to accept the proposals of the Gas Committee (as indicated in last week's "JOURNAL," p. 712) with regard to the provision of work for extra men among the unemployed. The men object to Sunday work; and it was the acceptance of Sunday as one of the working days of six that the Committee sought to urge. The men, on their side, suggest that the Corporation should find work for the unemployed by carrying out the Colsterdale Water-Works with Corporation labour, instead of employing a contractor.

Nottingham Gas Profits and the Unemployed.—The Nottingham City Council, at a special meeting, have resolved upon certain measures for temporarily relieving the prevailing distress; but exactly what steps are to be taken the newspapers have not been informed. It is, however, reported that the Council decided to immediately put in hand certain public works (for which Government sanction has been already obtained) at an estimated expenditure of about £15,000, and to supplement this by grants in deserving cases to workmen resident in the town; the money for this purpose being drawn from the profits of the gas undertaking.

Wolstanton District Council and the Chesterton Gas Company's Works.—At a meeting of the Wolstanton District Council on Monday last week, the Clerk laid before the Lighting and General Purposes Committee a report by Mr. Corbet Woodall on the subject of lighting Chesterton and the purchase of the Chesterton Gas Company's works. In the course thereof he pointed out that the time had come for the streets of the town to be lighted, and that it was open to the Council to do this by one of three courses. They could contract with the Chesteron Gas Company, invite Newcastle-under-Lyme Corporation to lay mains for the purpose, or undertake the duty themselves; and he expressed the opinion that the Council would do best for the ratepayers and the consumers of gas if they took in hand the supply. He thought the value of the Company's undertaking as it stood was £2150, and it would be necessary to spend £2500 in extending and improving the works and plant. The capital would then be £5000, including a small working balance, which would involve an annual charge of £250. A sale of 5 million cubic feet of gas per annum would suffice to provide enough profit to meet this charge; and he thought that with a little effort on the part of the officer in charge this sale could be promptly secured. It was resolved to open negotiations with the Company for the purchase of their works for £2150.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Wednesday, Nov 23.

(*Before Mr. Justice* SWINFEN EADY.)

Soothill Upper District Council v. Wakefield Rural District Council and West Ardsley District Council.

This was an action brought by the Soothill Upper Urban District Council against the above-named Local Authorities, to recover £890 for water they had not taken, on the footing of a minimum daily quantity, under an agreement duly entered into in 1895. The case was argued at considerable length in August last (see "JOURNAL," Vol. LXXXVII., p. 670), and his Lordship reserved judgment, which was delivered this morning.

Mr. EVE, K.C., and Mr. CLAYTON appeared for the plaintiffs; Mr. MICKLEM, K.C., and Mr. R. J. PARKER for the defendants.

Justice SWINFEN EADY commenced by stating the facts, and the questions in dispute. On Jan. 31, 1895, the plaintiffs entered into an agreement with the Wakefield Town Council, for the supply of water in bulk on certain terms. In this action, the plaintiffs asked a declaration that this agreement was valid and binding; and they claimed to recover the balance of money due on the footing that the Wakefield Council were bound to pay for a certain minimum quantity of water, even though it was not actually taken. The Wakefield Council denied the validity of the agreement on two grounds—first, that the sanction of the Local Government Board had not been obtained, pursuant to section 61 of the Public Health Act, 1875; and, secondly, that the agreement did not specify any pecuniary penalty, pursuant to section 174, sub-section 2, of the same Act. They further contended that they had paid for all water actually taken, and were not liable to pay for that which was not taken up to the minimum quantity; and they said that the reason why the quantity was not taken was that the low pressure at which it was supplied did not enable the water to be drawn in the higher portions of the defendants' district, where it was much needed. The plaintiffs denied that, according to the true construction of the agreement, they were under any liability to keep the water at such a pressure as would afford a constant supply at all times to all portions of East and West Ardsley; and, further, that if for any reason the agreement of 1895 was not valid, then the former agreements between the Soothill Upper Local Board and the Guardians of the Poor of the Wakefield Union—the respective predecessors of the plaintiffs and of the Wakefield Council—dated July 17, 1882, and Sept. 29, 1885, remained in force. A further point raised was whether the liability, if any, was not upon the Wakefield Rural District Council, but upon the Urban District Council of Ardsley East and West. He should treat the liability, if any, as that of the Ardsley Council. With regard to the first question—viz., whether the sanction of the Local Government Board had been given to the plaintiffs supplying water to the Wakefield Council, his Lordship went through the various applications to the Board by the predecessors of the present bodies, beginning in 1881, and said it seemed to him clear that the supply of water by the plaintiffs had been sanctioned by the Board, whether it was to be treated as a supply to the Wakefield authority or as one direct to the urban district of Ardsley East and West, which was the only supply he had to consider. The second objection taken by the defendants to the validity of the agreement of 1895 was the absence of any pecuniary penalty under section 174, sub-section 2, of the Public Health Act, 1875. Assuming that this sub-section was obligatory, and not merely directory, and applied only to contracts made by an urban authority, he had to consider how far the plaintiffs were affected by it. The Wakefield Council, being a rural authority, were not bound by any such provision. The provisions of the section were for the protection of an urban authority and of the ratepayers of the district. The penalty in sub-section 2 was to be made payable to, and in no case by, the urban authority, if the terms of the contract were not duly performed by the other authority. The price was to be paid by the urban authority for "the work, materials, matters, or things, to be furnished, had, or done," to or for the urban authority. Therefore the sub-section, from its nature and terms, only applied to cases where work, materials, matters, or things were to be furnished, had, or done to or for an urban authority, for a price in money to be paid by the authority; and it was provided that in such cases the contract should specify the time within which it was to be performed, and a certain pecuniary penalty. Sub-sections 3 and 4 showed that the section referred only to contracts where the money was to be paid by the urban authority, and did not include cases where the contract was to be carried out by the urban authority and the consideration paid to it. In the present case, the urban authority were to supply water to another person for a price to be paid to the urban authority. Were the latter to stipulate that, if they did not carry out the terms of the contract, they should themselves pay a penalty? That was absurd. Or were they to stipulate that if the purchasers did not pay the price in money, they should pay some pecuniary penalty? Obviously not, because the penalty was to be paid in case the contract was not duly peformed, not if the price was not paid. The real answer to the question was that the present contract for the supply of water by an urban to a rural authority was not within the section at all. The remaining question was whether it was owing to any default on the part of the plaintiffs that the defendants had not drawn their minimum supply of 700,000 gallons of water per week. The defendants said that many portions of their district were much in need of water, and they would gladly have drawn it if available, but that the pressure was not sufficient to send it to the higher parts of the district at the times when it was wanted. It was quite clear, on the evidence, that the plaintiffs had at all times, except when prevented by frost or accident, supplied to, and kept in, the mains a sufficient quantity of water to enable the defendants to draw the minimum

quantity in some portion or other of their district. It was, however, equally clear that the plaintiffs had not kept their mains continuously charged day and night with water at such a pressure as would enable a constant supply to be given at every portion of the defendants' district. The plaintiffs contended that they were under no obligation to do so. The extent of their obligation depended on the true construction of the agreement of January, 1895. It appeared from clause 4 that the Wakefield Council contemplated the construction within their district of a storage reservoir capable of containing 500,000 gallons, to receive the water supplied by the plaintiffs. It was to be at such an elevation that the level of the water therein, when full, should not be more than 515 feet above Ordnance datum. When this reservoir was completed, the maximum quantity the defendants were entitled to buy was to be doubled, and to be 250,000 gallons per 24 hours; and on receiving notice in writing from the defendants that they had commenced and intended forthwith to proceed with and complete the reservoir, the plaintiffs undertook to lay and complete, by the time the reservoir was ready, a new and untapped 10-inch main between certain points. This reservoir had not been commenced; and apparently any idea of constructing it had now been abandoned, and the 10-inch untapped main had never been laid. As such mains and storage as were mentioned in the agreement had never been provided, the circumstances under which the plaintiffs became bound to deliver water at a pressure sufficient to raise it 515 feet above Ordnance datum had never arisen. It was proved that the top water level in the Soothill reservoir was 14 feet of water. It was 571 feet above Ordnance datum; and the position of the Kennedy meter for Ardsley was only 341 feet above—the distance from the reservoir to the meter-house being about 5¼ miles. There was thus always a sufficient head of water to ensure the delivery into the meters at the Ardsley meter-house of 1000 gallons of water a day. It was contended on behalf of the defendants that, though not expressed in the agreement of January, 1895, it was an implied term, that until the storage reservoir was constructed the plaintiffs should supply water at such a pressure as would give a continuous supply to the whole of the defendants' district, night and day. The pressure was put by the defendants' witnesses, Massey and H. J. Silcock, at 80 lbs. to the square inch at the Ardsley meter-house; the latter saying that if at any time the pressure fell below this, the supply was practically valueless. Speaking generally, the day pressure had been higher than the night; but the evidence was that a service reservoir as near the point of distribution as possible would equalize the day and night pressure. In his opinion, the plaintiffs were not under any liability to supply water at such a pressure as would give a constant supply at all times to every part of defendants' district. It was quite clear that a continuous pressure of 80 lbs. was not necessary, nor anything like it, to enable the defendants to draw 100,000 gallons a day in some parts of the district. After citing a number of the figures given in evidence as to the average pressures, his Lordship said they were conclusive on this point. It was clear that some portion, at any rate, of the difficulties under which the defendants' laboured arose from the fact that they had in turn entered into agreements to supply water to others in excess of the amount which they themselves were able to command. They had now made an arrangement with the Corporation of Morley, under which they took water in bulk from them in considerable quantities. In his opinion, the defendants failed in their contention that the plaintiffs were bound, under the agreement or by implication, to keep up a pressure of 80 lbs. at the meter-house, so as to afford a continuous supply to every part of the Ardsley district. Moreover, if they were so bound, the defendants had rendered this impracticable by their arrangements for supplying others with water to a very large extent. If the plaintiffs were to keep their main always charged at the pressure contended for, the supply which would then reach the defendants, and those claiming through them, would very largely exceed the amount contracted for. For the foregoing reasons, he held that the plaintiffs were entitled to succeed, and to have judgment for the amount claimed—there being no dispute as to the figures. The judgment would be against the Ardlsey Council, who, it was agreed, were the parties ultimately liable to pay. There only remained the question of costs. After referring to the course which the action had taken, he said the proper thing would be to order the losing party—the Ardsley Council—to pay the costs of the plaintiffs and of the co-defendants, the Wakefield Council. The counterclaim of the Ardsley Council for damages failed for the same reason as their defence failed; and it must be dismissed with costs.

On the application of Mr. MICKLEM, who said the Ardsley Council would have to make a rate to raise the money, execution was stayed for six months; Mr. EVE, for plaintiffs, not objecting.

HIGH COURT OF JUSTICE.—CHANCERY DIVISION.

Tuesday, Nov. 29.

(*Before Mr. Justice* SWINFEN EADY.)

Nernst Electric Light Company, Limited and Reduced.

This was a petition presented to the Court for the purpose of obtaining a reduction of the capital of the Company.

Mr. EVE, K.C., and Mr. COLEFAX appeared for the Company.

Mr. EVE said the price paid by the Company for their patent rights seemed to be out of all proportion to their intrinsic value; and having now entered, as they hoped, on a dividend-paying career, they were desirous of getting rid of the incubus of a large amount of capital which was unrepresented by available assets. The original capital was £320,000, of which £140,000 was represented by preference shares, and £180,000 by ordinary shares. The Company expended £270,000 in the acquisition of patent rights, of which £180,000 was paid in ordinary shares, £25,000 in preference shares, and £65,000 in cash. The whole of the capital was issued; but 260 preference shares had been forfeited for non-payment of calls, and had not been reissued; the issued capital now being £319,480. Resolutions had been duly passed and confirmed for reducing the capital to £90,000, to consist of 90,000 ordinary shares. The arrangement was that the forfeited preference shares should be absolutely cancelled, and also £9,740 of those still outstanding; the holders receiving an equal number of ordinary shares in exchange for their preference shares—this class being therefore extinguished. Of the ordinary shares, 160,000 were to be cancelled; the holders of these shares surrendering eight-ninths for cancellation, and retaining one-ninth as ordinary shares—the whole of the shares in future to stand on an equal footing in every respect. The scheme had been before the shareholders for nearly twelve months, and there was no opposition to it. With regard to the loss of capital, this was verified by the affidavit of Mr. Drake, the Chairman of the Company, and by the Auditor, which stated that £229,740 had either been lost or was unrepresented by available assets. The Company was formed with the belief that it had acquired in this patent electric lamp an article of commercial value; and steps were taken to establish a laboratory, factory, &c., on which there was expended a sum of £17,355. But all the Company had to represent this outlay was certain machinery and plant valued at £250. Then there were investments in Consols, which had depreciated by about £2000 since their purchase. But the main item of loss was on the patents, which stood at £278,338. The British royalties, paid by licensees in this country, were estimated to be worth £20,000; leaving £258,000 for the original patent, according to which the Company were practically unable to manufacture saleable lamps at all. What they had to do was to purchase them from a Berlin Company, who had some secret process by which marketable lamps were made. It had therefore become a merely purchasing and selling Company; and seeing that the patent expired in 1913, the value of the patent rights could not be put higher than £40,000. Adding this to the £20,000 as the value of the British royalties, and a fair estimate for the tangible assets, book debts, &c., the figure of £90,000 had been arrived at.

The affidavits having been read,

His LORDSHIP sanctioned the reduction of the capital as asked.

AN UNSUSTAINED CHARGE OF EMBEZZLEMENT.

At the Lincolnshire Assizes, last Tuesday, before Mr. Justice Bucknill, Thomas Stormonth was charged with embezzling several sums of money, on various dates during 1903 and 1904, while occupying the position of Gas Manager to the Horncastle District Council. The charges occupied a page and a-half of the Calendar. At the outset, Mr. Appleton (who defended) raised an objection to the indictment, because it charged three separate offences in one count; but his Lordship over-ruled the objection.

The prosecution was undertaken by Mr. Walker, who said that upon the first indictment the defendant was charged with embezzling three different sums of money, amounting to about £4 10s. in all. At the time they were received, he was Gas Manager at Horncastle, which position he held between April, 1903, and June of this year. The question was whether he had accounted for this money or put it in his pocket. Mr. E. Tweed, the Clerk to the Council, said that defendant came there with high testimonials. He had twelve sets of books to keep and 700 meters to read, besides attending to the gas manufacturing operations, and other duties. For the first six months he was there, his time was taken up almost entirely with the carrying out of new works; and at the end of this time, the Council became aware that he was getting in arrear with his books. Cross-examined, witness denied that defendant told the Council they had got into a mess with their works, and it was their own fault. He got out the estimates, and refused to do any more work unless the Council paid him extra. He was consequently dismissed for disobeying orders; there being at that time no question of fraud. His Lordship: I suppose he had additional work thrown on him which did not come within the four corners of his agreement unless he was paid more money. Witness admitted that up to the time of his arrest on a warrant in Ireland, on Oct. 15, defendant had not been asked for an explanation with regard to the books. On hearing that the Auditor intended surcharging the amount, defendant forwarded a cheque for £17. Evidence was then given as to the payment of certain amounts; and Mr. Appleton said the receipt of these sums was not disputed. The defence was simply that the books had got into arrear. A witness named Pogson subsequently admitted that a cheque received by defendant had been paid into the bank to the credit of the Treasurer, though the amount was not entered in the books. This was one of the sums accused was charged with embezzling.

Mr. Appleton submitted that there was no case to go to the Jury. The prisoner was charged with embezzling three sums of money. He was properly entitled to receive the money; and how was it attempted to be proved that he converted it to his own use? By producing a clerk with a book in which the clerk had to make entries at the prisoner's direction. It had been shown in one instance that the money had been paid to the Treasurer and not entered; and on that he was charged with embezzlement. It was admitted that the accused was behind with his books; and he was given no opportunity to put them right.

His Lordship said he could not say that there was no evidence to go to the Jury; but he would be surprised if they found him guilty on such evidence. He did strongly say that to give the defendant no opportunity of explanation between the end of June and the time he was taken into custody, seemed to him to be—he did not wish to say anything too strong—a very lamentable condition. The Foreman of the Jury: We are satisfied there is no case. His Lordship said it appeared to him the prosecution had failed to make out that the prisoner committed anything with a guilty mind. He might have been irregular in his accounts, and stupid, and very much to blame; but it was a question whether, having received this money, and neglected to pay it over, he dishonestly kept it in his pocket. He dared say the Jury thought as he thought—that the man had not been given a fair chance.

No evidence was offered on the other indictments; and the accused was thereupon discharged.

The Willson Calcium Carbide Patent Case.

In the House of Lords last Tuesday, the Lord Chancellor and Lords Davey and Robertson gave judgment in an appeal by the Acetylene Illuminating Company, Limited, against a decision of Mr. Justice Buckley, in an action brought by them against the United Alkali Company, Limited, given on Feb. 3, 1902 (see "JOURNAL," Vol. LXXIX., pp. 284, 354). In the original action, the plaintiffs sought a declaration to restrain the defendants from infringing letters patent No. 16,705 of 1894, granted to Thomas Leopold Willson, of New York, for "improved metallic carbides, applicable for use in the production of acetylene, and means for producing same." The defendants alleged that the invention in question was not new, and that consequently the patent granted in respect of it was invalid; and they denied that they had infringed the patent. His Lordship decided both points in their favour, and dismissed the action with costs. The plaintiffs appealed; and the Superior Court (consisting of Lords Justices Vaughan Williams, Stirling, and Cozens-Hardy) supported his Lordship's decision. The case was then taken to the House of Lords. The Lord Chancellor said the appellants had failed to show that the invention was proper subject-matter for a patent. He had no hesitation in coming to the conclusion that the patent was invalid, because this was the view, and the only view, that had been taken of it by the Judges in the Courts below. He therefore moved their Lordships that the appeal should be dismissed. Lords Davey and Robertson concurred; and the appeal was accordingly dismissed.

Assessment Appeal by the Newport (Mon.) Gas Company.

The case of *Newport (Mon.) Gas Company v. Assessment Committee of the Newport Union* came before the Quarter Sessions for the county of Monmouth, at Usk, last Wednesday. Sir Edward Boyle, Bart., K.C., who was specially retained, and Mr. Rowlatt appeared on behalf of the appellants, for whom the witnesses retained were Mr. G. Humphreys-Davies, Mr. E. Herbert Stevenson, and Mr. T. T. Wainwright. The respondents were represented by Mr. W. C. Ryde and Mr. Corner, and the witnesses retained on their behalf were Mr. Helps, Mr. Faraday, and Mr. Mason. The assessment appealed against was a gross estimated rental of £13,000 and a rateable value of £8000 in the parish of Newport; and, without evidence being given by either of the parties, a reduction to a gross estimated rental of £11,405, and a rateable value of £6405, was agreed upon.

Automatic Water-Heaters at the Earl's Court Exhibition.

In the Chancery Division of the High Court of Justice last Friday, before Mr. Justice Warrington, Mr. Rowden, K.C., appearing, with Mr. Hart, for the plaintiffs, mentioned the case of *Ewart and Son v. Flugge*, in which they asked for an injunction to restrain the defendant from showing, at the Earl's Court Gas Exhibition, certain automatic water-heating stoves, on the ground that they were infringements of plaintiffs' patent. He said Mr. C. C. Scott appeared for the defendant; and he was glad to be able to state that terms had been arranged between the parties which would prevent his Lordship being troubled with the matter. By consent, there would be an order for a perpetual injunction in the terms of the notice of motion; the defendant undertaking to remove at once from the exhibition the water-heaters at present on show there, and also agreeing, during the life of plaintiffs' patent, not to exhibit or sell his heaters in the United Kingdom, or ship them here. Defendant would pay plaintiffs' costs as between solicitor and client in the action, and plaintiffs would withdraw their claim for damages.

Affairs of the Continental Incandescent Gaslight Company.

Last Tuesday, the action of *Rappelhoff v. Continental Incandescent Gaslight Company, Limited*, was heard before Mr. Justice Warrington, in the Chancery Division of the High Court of Justice. Mr. W. E. Vernon said it was a debenture holder's action; the plaintiff holding second debentures for £2000. In August, 1902, the Sheriff, at the instance of a judgment creditor, levied execution on the goods of the Company. The plaintiff claimed them, and an interpleader issue was ordered. At the first trial, the Jury disagreed; and before the second trial the plaintiff and the creditor halved the proceeds of the sale of the goods which had been paid into Court. Therefore the plaintiff received half of the fund, and had realized so much of his debentures. Mr. Scott, who was the Liquidator, had resigned; and the Company did not now appear. He therefore asked for judgment. His Lordship gave judgment for a declaration as claimed by the plaintiff, with costs.

Bankruptcy of M. Ellis Lever.

At the Bangor Bankruptcy Court last week, Mr. Ellis Lever, now residing at Colwyn Bay, but formerly of Manchester, appeared for his public examination. Our readers may remember that he at one time carried on a coal merchant's business at Piccadilly, Manchester, and figured conspicuously in connection with the Salford scandal. He sold the business to his son-in-law for £12,000. In 1898, he purchased the Bryn-yn-Enadd Estate, at Llanfairfechan, for £26,000; and in three or four months sold the property for £32,000 to a gentleman on the Liverpool Stock Exchange, who failed to carry out the contract. The property was subsequently sold to the Northampton Asylum Board for £37,500. In 1902, Mr. Lever had the selling of the Avery Hill Estate, at Eltham, which was ultimately disposed of to the London County Council for £25,000. The debtor claimed £1000 commission; but it was declined. He brought an action against the vendor; but the case was compromised, and he received £25 and his taxed costs. He once owned Culcheth Hall and Estate, Bowden. He lost £4000 to £5000 on the Stock Exchange. The examination was adjourned.

MISCELLANEOUS NEWS.

LONDON COUNTY COUNCIL AND THE GAS QUESTION.

The Bill Sanctioned.

At the Meeting of the London County Council last Tuesday, the report of the Parliamentary Committee on the subject of the supply of gas in the Metropolis, and the suggested action of the Council next session in regard thereto, given in the "JOURNAL" for the 29th ult. (p. 710), was presented.

Dr. T. B. NAPIER (the Chairman of the Committee) having moved the reception of the report,

Sir WILLIAM COLLINS inquired whether due considerations had been given to the recommendations of the Departmental Committee, whereby the Council would abolish altogether the testing of gas for sulphuretted hydrogen and other sulphur impurities. He said this was the very condition of impurity to which importance was attached in the testing under the administration of the Public Control Committee of the Council. He gathered that the Committee had not been consulted in proposing these sweeping changes, which were rather to the advantage of the Gas Companies than to that of the community.

Dr. NAPIER said he was afraid he could not discuss the matter from a technical point of view. The course adopted by the Parliamentary Committee was entirely in accord with the views of the Public Control Committee and its Chairman (Mr. Harben); and he thought some other members of the Committee conferred with the Parliamentary Committee when the matter was decided. Although Sir William Collins's remarks were probably justified, the change proposed was in accordance with the report of the Departmental Committee who considered the matter. The recommendations of that Committee were mostly in favour of the public, at the expense of the Gas Companies. But the provision as to sulphuretted hydrogen was one rather in favour of the Companies; and it had only been adopted to a modified extent in the Council's Bill. He did not suppose the Council themselves, as a whole, were very much interested in the technical aspect of the case. He might say, in summarizing the situation again, that the Parliamentary Committee had taken as much as they could of the portion of the report of the Departmental Committee which was in their favour, and had introduced into their Bill as little as they conscientiously could of the part which was not in accordance with their views in regard to the promotion of a Bill.

The report was then received, and the recommendation adopted.

MUNICIPAL TRADING BY THE EDINBURGH AND LEITH GAS COMMISSIONERS.

The Commissioners Approve of Trading.

The Monthly Meeting of the Edinburgh and Leith Gas Commission was held on Monday, the 28th ult.—Provost MACKIE, of Leith, in the chair.

The CLERK (Mr. J. M'G. JACK) said that he had received a letter from the representatives of the Plumbers and Ironmongers' Association, asking for copies of the minutes of the proceedings of the meeting on the 10th of October, together with the notes thereon by the Engineer, and reminding the Commissioners of the Association's petition, which was that a Committee be appointed to meet them, with a view of receiving their proposals. No action was taken on this letter.

Correspondence that had taken place between Mr. W. R. Herring, the Engineer, and Mr. Kenward Shiells, the Auditor, and a letter from Bailie Douglas to the Clerk were also read.

Bailie BRYSON, of Leith, Convener of the Works Committee, moved approval of the recommendation of the Committee, which had been adopted by fifteen votes to six, and was to the effect that they adopt the report of the Sub-Committee. The Sub-Committee recommended that the Commissioners should continue the show-rooms and offices for the sale of gas-cookers, gas-fires, and other gas appliances, as being necessary for carrying on the Commissioners' business. They further resolved to recommend that a circular should be sent out to all the tradesmen connected with the selling of gas apparatus, explaining the terms on which they could be supplied with all goods sold by the Commissioners; and they also resolved to ask authority from the Commissioners to adjust the terms. It was also reported that Bailie Douglas had dissented from that report. Bailie Bryson, in support of his motion, said he thought the Committee gave every consideration to the question; and—Bailie Douglas dissenting—they came unanimously to the finding before them. He did not see any reason for opening up that question any further.

Mr. R. MENZIES seconded the recommendation.

Bailie DOUGLAS moved that "The Committee having considered the report of the recent conference and memorials of merchants and tradesmen, and Mr. Herring's memorandum with regard to trading by the Commissioners in gas appliances, and fitting up of same, all as contained in the accompanying appendix, disapprove in general with the principle of municipal trading, and find, (1) That the sale of gas appliances, as at present engaged in, is within the power of a Gas Commission. (2) That the provision of local stores as depôts for the workmen of the Commission, and as show-rooms, might be continued, as at present (seeing that the shops have been taken and fitted up), subject to an investigation as to their cost and their usefulness to the Commission and to the consumers, after there has been sufficient time and experience of their working, and also a report by a qualified accountant as to the accounts of the stove department. (3) That a circular should be sent out to all tradesmen connected with the sale of gas appliances, explaining the terms on which these can be obtained by them from the Commission; the terms of such circular including the

amount of discount allowed to consumers and *bonâ fide* traders, this to be adjusted by the Sub-Committee. The Committee beg to recommend accordingly." He said that on page 10 of the report of the conference it was distinctly stated that the deputation were opposed on principle to corporation trading; and that was the ground which he had contended for all through. But, in addition to this, the result of the Gas Commission trading showed a considerable loss each year, That loss was not faced in the bold and satisfactory way of the gas undertakings of other towns, but the charge was carried to the revenue account under gas distribution. It seemed to him very doubtful whether Mr. Herring could show any profit at all, because on investigating the accounts of work done by the Corporation at Newington South Free Church, he found less than the standard rate of wages was charged. Work had been done in connection with other churches throughout the town; and reference had already been made to this in the traders' report. He found there was a loss of £5956 on transactions for the last two years. This amount did not include anything for management or office expenses, which, taken at 10 per cent. on the gross expenditure, would show a further loss of over £6000. The expenses for repairing and fitting up, &c., for 1904 were £3388, or more than the sum received for hires. It would be bad business, even if one had no capital on which to pay interest, to pay out £3388 in order to receive £3296; but when there was a capital, on which interest was running, and a commodity rapidly depreciating through use, it was surely time to put up the shutters. He thought it was well that, in order to clear this matter up in a satisfactory manner, the terms of his motion should be adopted, and that a qualified accountant should be appointed to go over the accounts and ascertain accurately the amount of profit or loss; and also that the accounts of the Stove Department should be put on a proper commercial basis. This was a reasonable request; and he hoped the Commission would agree to it.

After some conversation as to the competency of this motion, Bailie Douglas limited it to the re-committal of the subject.

Mr. A. A. Murray seconded. He said that, on going over the papers, he came to the conclusion that, whatever the ultimate result might be, it would be wise of the Commissioners to make some further inquiries, and to have some further analysis of the figures. On looking through the accounts, he could not trace all the stoves; and he thought it was time that the Auditor showed how this matter stood. He would like to see all the figures brought out, and the results of the sales given. Then, take the expenses of repairing and fitting up. Last year there were 373 cookers fitted up, at an expense of 11s. 4½d. each. The total cost of fitting up, as in the statement before them, was £3388. Divide this by 6773, the number of cookers on hire, and they would find that each stove cost them 9s. 4d. per annum for repairing and fitting up. But the average hire of a stove was 9s. 1·1d. per annum. This was a loss of 3d. upon each stove every year. The point he was making was that on the figures supplied there was something which required their consideration; and he would like that Mr. Herring should have an opportunity of going over the figures and giving them some explanation. The figures he had given did not take into account interest, depreciation, and a host of other things. The broad fact remained that stoves for which they had paid about £26,000 were valued at present at about £12,000; so that there was a loss of £14,000, in round figures, which had been put against the consumers, apart from interest, depreciation, management, or any other charges.

Mr. D. R. Young asked Mr. Herring whether, as stated, there was a saving of £2600 a year to consumers by the use of gas-stoves.

Mr. Herring said it amounted to more than that. This was the extra gas sold through the same pipe and the same meter in the same house. In his statement, he said that "if it were not for the manner in which the gas-stove business had been worked, the consumers would have to pay at least 1d., if not 2d., per 1000 cubic feet more for gas." A penny per 1000 cubic feet represented practically £7000; so that the consumers received about £10,000 or £12,000 a year as the result of the consumption of gas in cooking-stoves.

Mr. Young said that, although he had every sympathy with the traders, the injury to them was infinitesimal when compared with the advantage given to the large number of gas consumers.

Mr. W. F. Stewart thought that the Auditor should make some statement as to the finances of the department.

Bailie Bryson said this matter had been before the Committee, and they had come to the conclusion that the accounts of the Gas-Stove Department had not been sufficiently stated. They were of opinion that a better method should be adopted. The stoves depreciated to the extent of 25 per cent.

Bailie Douglas said it was only during the last six years depreciation had been written off—ranging from 1 to about 25 per cent.

A vote was then taken, when seventeen members voted for approval of the recommendation and four for re-committal.

NOTTINGHAM CORPORATION AND LOCAL IRONMONGERS.

In May last, a notice was issued by the Gas Department of the Nottingham Corporation to the effect that from Jan. 1, 1905, the Gas Committee would be prepared to let out on hire certain gas-fires and radiators at an annual rental of not less than 10 per cent. of the cost price of the apparatus. This notice was considered by four of the local trade Associations to be an encroachment upon their business; and they asked the Committee to receive a deputation of the various trades interested. This the Committee consented to do, and a deputation was recently received at the Gas Offices. Mr. E. Harlow occupied the chair. The General Secretary (Mr. R. H. Smith) first directed attention to the resolution of the Committee recommending that clauses should be inserted in the Bill now being promoted by the Council to empower the Corporation to make regulations governing the size and method of laying these internal gas pipes and fittings, and to enforce the regulations, and for the superintendence of installations. He asked if this meant that the Committee contemplated supplying and fixing internal fittings. The Chairman replied that the resolution was to authorize the Committee to employ assistance for the inspection of work, so that they might be assured that it was properly carried out. Mr. Smith expressed the willingness of the Associations to abide by any regulations made as to the size of piping, fittings, &c., so long as the internal work was left to them. The Town Clerk (Sir S. G. Johnson) remarked that the Corporation had never done any work beyond the meter, and did not intend to do any. Mr. Smith said that, in view of this assurance, the Association would not oppose the insertion of the clause in the Bill. The Chairman said there only now remained the question of the gas-fires; and he thought the position of the Committee with regard to these and gas-cookers would be somewhat similar. Before they were hired out there were only some 600 in use; now there were about 20,000. Mr. Smith contended that there was no analogy between a cooker and a fire. He said a gas-fire was only a season article, and could be purchased for a very small sum; whereas the cooker was possibly used all the year round. The traders had always kept large stocks of gas-fires, and had done considerable business in them. It was true that they did not let them on hire; but they objected to the Corporation doing so, because the traders would be called upon to pay rates which would be employed for practically ruining this branch of their business. If the Committee should be determined to let gas-fires on hire, he asked that they should leave the fitting and fixing of them to the traders, who were fully competent to do the work. The Chairman promised that the Committee would give these matters due consideration, and the deputation then withdrew.

PRESENTATION TO MR. WILLIAM HARDIE.

On Saturday, the 26th ult., an interesting presentation took place at the works of the Tynemouth Gas Company; the recipient being Mr. William Hardie, who has completed 25 years' service with the Company as Engineer and Manager, and, moreover, as our readers are aware, has just been elected a member of the Municipal Council. The proceedings commenced with a tea, which was partaken of by a large number of the officials and workmen. At its conclusion,

Mr. J. Blenkinsopp, who presided, made the presentation, which consisted of a handsome gold watch. In handing over the gift, in the name of the employees, he said at the outset that he wished to congratulate Mr. Hardie upon his election at the head of the poll as one of the representatives of Trinity Ward. Notwithstanding the fact that he was practically unknown in public life, he secured a majority of 200, which indicated that the electors appreciated his exceptional business qualities; and he (the Chairman) had reason to believe that Mr. Hardie would fully justify the selection the electors had made, and would render invaluable service in their interests at the municipal parliament. They were met that night to tangibly recognize the completion of Mr. Hardie's 25 years' service as Engineer and Manager under the Tynemouth Gas Company. Mr. Hardie was appointed to the position at the early age of 22; and during his quarter-of-a-century of service, many changes had been effected and great progress had been made. When he first came to them, the annual make of gas was 125 million cubic feet. Last year it was 401 millions; and he had the authority of Mr. Hardie for saying that this year it was likely to reach 410 millions. So that, in spite of their competitor, electricity, they were still making marked progress. By Mr. Hardie's strict attention to the duties pertaining to his responsible position, he had the confidence of the Directors of the Company; and by his courteous and generous treatment of the workmen, he had won their universal respect and esteem. When the idea of making him a presentation was first mooted, the matter was taken up very readily; and there was no difficulty experienced in procuring a substantial token of their regard for him. That he deserved such recognition, they would all agree. He had been most successful in his management; and under his careful and experienced directions the works had grown to such perfection that those interested in them had reason to be proud of them. He concluded by asking Mr. Hardie's acceptance of the watch, which bore the following inscription: "Presented to Mr. William Hardie, by the Employees of the Tynemouth Gas Company, as a token of their esteem and respect, on the completion of his 25 years' service as Engineer and Manager. 25th Nov., 1904.

Mr. Hardie, who was most cordially received, said he desired to thank them for the very valuable and useful token of their respect and esteem. He appreciated their kindness very much, and the spirit which prompted it; and he valued the gift chiefly because it had been subscribed for by the employees. When he first came to North Shields and had to appear before the Directors, there was one thing mentioned against him, and that was his youth. He remembered, however, that Mr. Atkinson, who was then Secretary of the Company, remarked that this was a disqualification he was likely to grow out of. That prophecy had been fulfilled; and the 25 years he had been in the service of the Company had passed all too rapidly. During that period he had acted under no less than five Chairmen; and the kindness and courtesy he had received from everyone had encouraged him in his work. He was exceedingly proud of the excellent feeling that existed between himself and the workmen of the Company. It had made his work not an arduous task, but a labour of love. His object had always been that gas should be sold as cheaply as possible. Towards this end new processes had been introduced, and the works were conducted upon a more scientific basis than they were formerly. The result was that the price of gas to-day was about half what it was 25 years ago. He was pleased with this result, especially so because it had been brought about without the workmen being detrimentally affected. During the period of his service, the ordinary labourers' wages had been increased 25 per cent., and the firemen's wages 13 per cent.; while the shifts had been reduced from 12 to 8 hours. In addition to this, the conditions of labour had been vastly improved. With regard to the total amount of wages paid, he might say that for £1 paid 25 years ago the Company now paid £3, which proved that the workmen were receiving a share in the prosperity of the concern. The Tynemouth Gas Company did not hold a unique position in regard to the prosperity of the gas

industry. He remembered the electric light scare. Gas was to be wiped out; nevertheless the industry was never in a more flourishing condition than it was at the present time. In conclusion, he repeated with pleasure that there was a good feeling existing between employers and employed. He, as Engineer and Manager, had endeavoured to work harmoniously with the men; and the gathering that night was an evidence that, even if he had been compelled upon occasion to act in opposition to their wishes as a servant of the Directors, he had done so in such a manner as not to lose their respect and regard.

The remainder of the evening was devoted to harmony. Before the company separated, a vote of thanks was accorded to Mr. Hardie for his hospitality, and another to Mr. Blenkinsopp for presiding; and the singing of "Auld Lang Syne" and the National Anthem brought a most enjoyable evening to a close.

PROVINCIAL RATES AND GAS, ELECTRICITY, AND WATER CHARGES.

We have received from Mr. James Carter, the Borough Treasurer of Preston, a copy of his tabulated statistics of the rates levied and collected, and the charges made for gas, electricity, and water, in a number of provincial towns and a few Metropolitan Boroughs, for the year 1904-5. There are 88 places in all—being five more than in last year's list (noticed in the "JOURNAL" for Dec. 8, 1903). The newcomers are: Cardiff, Dudley, Exeter, Heywood, and Nelson. The populations range from 723,430 (Liverpool) down to 20,288 (King's Lynn). The rateable values are highest in Westminster (£5,595,199), Liverpool (£4,416,061), and Manchester (£3,629,003); and lowest in Bacup (£84,088), King's Lynn (£83,127), and Stafford (£81,632). The places most heavily rated are: Wolverhampton, 10s. 1d.; West Ham, 9s. 10d.; Norwich, 9s. 7d.; East Ham, 9s. 6d.; Rotherham, 9s. 2d.; and Halifax and Wakefield, 9s. Those which have the lightest rates are: Bournemouth, 5s.; Lancaster, 4s. 6d.; and Oxford, 4s. 4d. Out of the rents of property and profits transferred from municipal undertakings, the rates are reduced in the following towns to the extent named: Carlisle, 1s. 8d. in the pound; Darlington, 1s. 7¾d.; Wigan, 1s. 6d.; Macclesfield, 1s. 4d.; Nottingham, 1s. 1½d.; Bolton, 1s. 1·2d.; and Dewsbury, 1s. 1d. Eastbourne relieves the rates to the extent of 0 8d. in the pound; Bournemouth contributing 0·75d.; West Hartlepool, 0·7d.; and Bacup, 0·4d.

Coming to the table giving the charges for gas and water, we find that the price of the former is still highest at King's Lynn (3s. 6d. per 1000 cubic feet), and lowest at Widnes (an average of 1s. 3d.). The following towns also have the advantage of gas at a very low figure: Sunderland, 1s. 11d.; Bury, 1s. 10d.; Gateshead and Newcastle, 1s. 9·6d.; and Plymouth, 1s. 9d. The rates for electricity range from 8d. down to 3¾d. (Liverpool) and 3½d. (Salford) per Board of Trade unit. The charge for water for domestic purposes on a house of £15 rateable value is highest at Bury, Heywood, and Rochdale—2s. in the pound; Ashton-under-Lyne coming next with 1s. 11d. It is lowest in the following towns: Birkenhead, 10d.; Bootle, Brighton, and Leamington, 9d.; Manchester, 8d.; and Liverpool, 6d. In the Metropolis, the charge in Islington is 12·8d., in Westminster 9·6d., and in Kensington 9·5d. The other places in which the charges are less than 1s. are Bournemouth, Plymouth, Reading, Salford, Southampton, Widnes, and York. At Preston (Mr. Carter's own town), the local rates are 8s. 10d. in the pound; and they are relieved to the extent of 8d. by the rents of property and the profits transferred from the gas, water, and other undertakings. The price of gas is 2s. 11½d. per 1000 cubic feet; of electricity, 7d. per unit; and of water, 1s. 2d. in the pound on £15 houses. Mr. Carter has this year given a third table, showing the amount estimated for the current year to be transferred to the borough, district, or other fund from profitable undertakings, and the amount in the pound by which the rates are reduced in consequence.

ELECTRIC STREET LIGHTING AT MAIDSTONE.

Writing to the "South Eastern Gazette" on the subject of the unsatisfactory public lighting of Maidstone, "Benighted" says: "Our side streets are simply a disgrace, and even some parts of our main streets (Week Street from High Street to Earl Street, for instance) are condemned to a state of semi-darkness during the greater part of the night. Is this an outcome of our boasted twentieth century progress? It is a fact that London and many of the important towns of Great Britain are now supplanting electric light with gas for public lighting, as the latter has proved a better and more economical illuminant; yet little Maidstone is calmly proceeding in the other direction. Why, then, does Maidstone take all this lying down? Political parties fight for representation on the Town Council; and yet neither party nor the ratepayers appear to care a brass farthing whether their representatives will consult their safety and convenience, and practise due economy in the matter of street lighting. What is the fetish that conjures us into this condition of indifference? I can account for it in no other way, but as through the influence of a socialistic idea of municipalization. Because the electric undertaking is ours, we will put up with any inconvenience, or pay through the nose to any extent, in order that we may be allowed to bow to our own Mumbo Jumbo. Probably the public takes the same attitude in regard to the electric light as Touchstone took with regard to Audrey—'An ill-favoured thing, Sir, but mine own.' It will be interesting to watch the development of the awakening in these matters, which will surely come, though it is painful in the meanwhile to have to grope our way in darkness, with the knowledge that we are paying a high price for our stupidity."

The Commercial Gas Company (as will be seen by an announcement which appears in our advertisement columns) invite applications for an issue of a balance of £9595 of 4 per cent. capital stock.

LAMBETH WATER-WORKS COMPANY.

(In Liquidation.)

The Ordinary Half-Yearly General Meeting of this Company was held on Tuesday last at the offices, Brixton Hill—the Right Hon. Viscount HAMPDEN, G.C.M.G., presiding.

The SECRETARY (Mr. H. Wilkins) read the notice convening the meeting and the Auditors' report.

The CHAIRMAN, in moving the adoption of the report, said he only desired to refer to the paragraph in it relating to the payment of the dividend. The accounts were on the table, and were open to the inspection of any shareholder. With respect to the payment of a dividend, a difficulty had arisen. The Water Board were in possession of the cash available for the purpose, with the exception of an amount of £28,232, which was in the Company's hands. The Water Board were not empowered by law to transfer any amount of cash necessary for the payment of a dividend except upon the certificate of the Official Auditor, Mr. Stoneham. The Company had endeavoured to get him to deal with the matter promptly; but they had failed. They could, of course, ask the Water Board for an interim payment. They had done so, and they awaited a reply. In the meantime, if the reply did not come into the Company's hands before the end of the week, they would not be in possession of sufficient cash to pay the whole dividend on Jan. 9. Failing the receipt of any sum from the Water Board this week, the Company had in hand the £28,232, which would enable them to pay the shareholders a dividend for the five months from March 31 to Sept. 1 at the rate of 5 per cent. per annum on the 10 per cent. stock and 3¾ per cent. per annum on the 7½ per cent. stock. Of course, the Board would take power from the shareholders, in the resolution which was to be put before them shortly, to pay a dividend when the certified profits came into their hands.

Mr. G. E. N. RYAN seconded the motion, which was adopted.

The CHAIRMAN then moved that the Directors be authorized to distribute the sum available for dividends as well for the period from March 31 to Sept. 1 last as for the subsequent period down to the date of the dissolution of the Company, in one or more sums, as and when they think fit in the following manner: (1) In payment of a dividend at the rate of £7 10s. per cent. per annum on both denominations of the capital stock of the Company for the period from March 31 to Sept. 1 last. (2) In payment of a further dividend up to the prescribed rate of 10 per cent. per annum on the £1,043,800 of 10 per cent. stock for the same period as far as the amount available for distribution will admit. (3) Any surplus to be distributed at the same rate per cent. on both denominations.

Mr. W. J. FRASER seconded the resolution, which was adopted.

Mr. H. MITCHELL moved, and the Rev. G. E. GARDNER seconded, that the sincere and hearty thanks of the proprietors be accorded to the Chairman and other Directors of the Company for the able and efficient manner in which they and their predecessors had at all times directed their affairs; also to the Secretary and the other officers of the Company, who had at all times discharged the important and responsible duties of their respective offices. He regretted that this would be the last occasion on which he could propose such a vote.

The CHAIRMAN, in replying on behalf of the Directors and staff, said he believed they had transferred to the Water Board not only a prosperous Company, but one which would be progressively prosperous. He thought that they would leave their conduct of the business to be justified by the acts of their successors. The curious thing was that, since the business had been transferred to the Water Board, the Government Analysts had made nothing but the most satisfactory reports as to the quality of the water that had been supplied. The article was the same; but in the Company's hands it had all the demerits possible, and was charged with being dirty and deficient. Now that it was in the hands of the Water Board, it was said to have every quality which it ought to possess.

Mr. WILKINS having also replied, the proceedings terminated.

Wallasey District Council and their Engineer.—A discussion took place at the last monthly meeting of the Wallasey District Council with regard to a recommendation by the Gas and Water Committee, that the Engineer be requested to return a cheque for £130 17s. to the Malvern Council, in respect of work done by Mr. J. H. Crowther, as it was not authorized by the Council. Mr. Steel remarked that the minute was not quite correctly reported; and he moved, as an amendment, that the word "recommended" be inserted in place of "requested." Mr. Joyce said that Mr. Crowther was asked to report upon the work he had done for the Malvern Council, in regard to which he was to receive 2½ per cent. on the outlay. It now appeared that his fee included money for the outlay upon destructor works, which was another matter altogether. After some discussion, Mr. Lloyd, the Chairman of the Gas and Water Committee, said that Mr. Crowther was a straightforward and honourable man, and it was not fair to make suggestions about him. The amendment was carried.

Skipton New Water-Works.—A beginning has been made with the carrying out of the new water supply scheme for Skipton. A permanent 12-inch main is being laid to the site of the intended reservoir at the foot of Embsay Moor. It will then be taken outside the top water line of the intended reservoir to the stream known as Moor Beck, where a weir will be made. This weir, which will be about 730 feet above sea level, will be so constructed that it will pass the compensation water required; the surplus water being taken through the main to the town. To ensure the best water being supplied, the Whitfield Springs, which yield 150,000 gallons per day, will be conducted to the weir. The Embsay Moor reservoir, which is about 2 miles from the centre of Skipton, will have one embankment right across the valley. The capacity of the reservoir will be 120 million gallons; and the drainage area (practically all moorland) is 700 acres, which is capable of yielding 783,000 gallons per day. The total estimated cost of the scheme is about £70,000. Messrs. Hill and Son are the Engineers, assisted by Mr. J. Mallinson, the Surveyor to the Council.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

At last the Edinburgh and Leith Gas Commissioners have got to the end of their present trouble with the traders as to their dealing in gas cooking and heating appliances. I say present for two reasons. It is open to anyone to start a fresh agitation at any time; and the Commissioners themselves have left a loophole for the continuation of the existing movement by their resolution to offer terms as to discount to the traders. Probably if they had offered this at first, there would have been less heard of the traders, for, as was pointed out in this column several weeks ago, the objectors were not so much opposed to the principle of municipal trading as they were to the fact that the Commissioners gave them no advantage over that which they gave to the community in general. If it were not that all trading is of a selfish nature (no one manufactures or distributes goods for the love of the thing, but for what he can make out of his work), it might have been possible to dub the movement an essentially self-seeking one; but, in the circumstances, it must be admitted that the traders were actuated by a genuine trading spirit—the desire to make profit. True it is—and it was a weakness of their position—they sought to make profit out of work which the Gas Commissioners were, in their opinion, doing for them. In other words, their intention was to take personal benefit by the employment on their behalf of the capital of the Gas Commission and the energies of the officials of the Commission. The Commissioners say that the traders charge too much for appliances, and that they can sell them at a handsome profit at less figures than the traders; the traders say that the profits of the Commissioners are not derived from the sale of appliances, but involve a loss which is made up out of the revenue from the sale of gas. Of course, this is only opinion; and it is the opinion of those who have not access to the books of the Commissioners, and is therefore not a supported opinion. If the traders have failed in the region of opinion, they have failed in their strongest count; for upon the facts they were entirely out, as a reference to the replies by Mr. Herring, given in the "JOURNAL" for Nov. 15, will satisfy all who have an open mind upon the subject. The traders, in their memorials, made what the lawyers term a relevant case; but it broke down hopelessly when put to the test. There is another small matter which has been evolved, that is the proposed change in the form of keeping the gas-stove accounts. It does not follow that this subject has any connection with the movement of the traders; on the contrary, the probability is that it would have been taken up apart from outside influences. But whether or not any change which can be made, consistent with present conditions, it can only be a small one. The agitation is over, and it must be confessed that it has done next to nothing towards the clearing up of questions as to the rights or wrongs of municipal trading. The case of the traders was presented in too parochial a spirit, and was handled in too loose a manner by their representatives, to be productive of anything except local effect—and of that it can only be said that it has been a case of "great cry but little wool."

Among other business before the Commissioners was a statement in the minutes of the previous meeting, that the Treasurer had been instructed to obtain from the Commercial Bank of Scotland, Limited, on as favourable terms as possible, a loan for one month not exceeding £120,000, to be renewed from month to month until the loan should be extinguished by mortgages or otherwise. It also appeared from the minutes of the Works Committee that complaint has been made of the pollution of the well of the Carlton Hill Brewery by effluent from the Edinburgh Gas-Works, now practically disused, and that the Committee had visited both the gas-works and the well, and had resolved to have a meeting later on the subject. The Commissioners have asked the City Gardener to report to them as to what trees or shrubs he would recommend to be planted close to the gasholder at Granton, and the expense thereof, in order to demonstrate that the gas-works had no injurious effect upon neighbouring vegetation.

The Town Council of Maybole on Monday considered the subject of the adoption of the Burghs Gas Supply Acts, with a view to the taking over of the undertaking of the local Gas Company. They had previously adopted a resolution in favour of the adoption of the Acts; and this was the confirming resolution, after the municipal election. For what reason it is difficult to say, but the meeting of the Council was held in private; and all that is known about it is the intimation that the Acts were adopted, and that the Council agreed to the valuation of the Company's Valuator, said to be over £10,000. Maybole is a town of 6000 inhabitants. There is a yearly consumption of gas of over 11 million cubic feet, the price of which is now 4s. 2d. per 1000 cubic feet. Mr. James M'Farlane is the Manager.

The application by the Corporation of Glasgow, under the Private Legislation Procedure (Scotland) Act, 1899, as intimated in the "JOURNAL" last week, is, so far as regards the gas undertaking, for power to borrow an additional sum of £1,000,000. The borrowing powers of the Corporation are at present £3,200,000; but of this sum £1,400,000 is for electricity purposes. There remains to be borrowed—for gas purposes £25,000, and for electricity purposes £250,000. The necessity for an increase of the borrowing powers was recognized by the Town Council when they adopted the annual report of the Gas Committee in September last.

The fireman whom I mentioned as having been injured by an explosion in the oil-gas works of the North British Railway Company on Thursday of last week, died of his injuries in the Royal Infirmary on Sunday. He was accorded a public funeral, at which there were present representatives of the Corporation and members of the kindred fire brigades. At a meeting of the Glasgow Town Council on Thursday, Mr. Gibson asked if an explanation could be given with regard to the accident. Bailie Steven said the matter would be dealt with by the Fire Brigade Committee; but, so far, no one knew how the explosion occurred. Mr. Gibson said his object in mentioning the matter was to

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enable him to put a supplementary question as to the legality of the position of the Railway Company. He understood they were making gas in Hunter Street, which was not only a nuisance to the whole community, but had been proved to be a danger to life. Bailie Steven said he did not know what power the Railway Company had, but the Committee would make all inquiries.

At a meeting of the Dundee Town Council on Thursday, the subject of the testing and stamping of gas-meters within the city came up in the minutes. Mr. Urquhart drew attention to the clause in the minutes which stated "the Committee further resolved that an additional assistant to the Inspector be appointed, if that be found necessary." In Mr. Urquhart's opinion, this clause should not be adopted, because, if it were, he had no doubt but that it would be found to be necessary to appoint an assistant. Mr. Brownlee asked what was the use of their agreeing to have the meters stamped in Dundee unless they provided the means for doing the work. He moved approval of the minute. Mr. Mechan, in seconding, said that even if they did appoint another man there would be a profit on the work. Bailie M'Kinnon said the Inspector told them over and over again that the work could be done in his workshop without any extra man at all. Mr. High thought that no one among them would have entertained the proposal if they had understood that an appointment was to be made. On a division, the clause was disapproved by 16 votes to 12.

At the same meeting, Mr. Robertson moved that in future all contracts for coal should be submitted to, and considered by, the Finance Committee. There was, he said, no department of the Council's trading business that had given more dissatisfaction, and had been a more constant source of worry and anxiety, both as regarded quality and price, than coal buying. He objected to the transactions of the Coal Committee appointed to purchase for the gas-works, chiefly on the ground that their meetings were never reported to the Council. The Baths Committee, through their Superintendent, bought coal for other departments, and the Electricity Committee bought for themselves. All over there was a lack of system. The Finance Committee, composed as it was of the conveners of all the Committees, was the proper body to purchase. The motion was rejected, only two voting in its favour.

Lewisham Borough Council and Local Companies.—The Lewisham Borough Council decided on Wednesday to make claims amounting to £1143 against various local Companies for reinstating roads and footpaths broken open during the quarter. The above sum includes a claim for £291 against the South Metropolitan Gas Company and £51 against the South Suburban Gas Company. The General Purposes Committee reported the result of the summonses issued against the last-named Company for supplying gas of deficient illuminating power and purity, and added that they had received a further report from the Gas Examiner, and had directed that other tests should be made. The report was adopted.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Dec.* 3.

Sulphate of Ammonia.

November contracts being covered, the market assumed a quieter tone, though all parcels offered have found a ready sale. There has been a moderate amount of direct business at the latest advance, but for the most part buyers abroad have not yet come into line with current prices. Consequently buying is still mainly for covering purposes. The closing quotations are £12 15s. per ton f.o.b. Hull, £12 18s. 9d. per ton f.o.b. Liverpool, and £13 1s. 3d. per ton f.o.b. Leith. A sale is reported to have been made for January-June delivery at £13 5s. per ton f.o.b. West Coast port; and this is probably the nearest closing value. For July-December makers quote £12 12s. 6d. to £12 15s. per ton f.o.b. Leith. London makers are practically off the market, though £13 5s. per ton, on the parity of Beckton terms, has been accepted for December, 1904-January, 1905, delivery.

Nitrate of Soda.

This article remains firm, and spot prices are 11s. and 11s. 3d. per cwt. for ordinary and refined qualities, respectively.

LONDON, *Dec.* 3.

Tar Products.

Markets have been very steady during the past week; and as a rule prices show an upward tendency. Further business in benzol is reported in London for 90 per cent. at 10½d. and 10¾d. for prompt delivery; but in the North somewhat lower prices have been accepted. Some 50-90 per cent. is reported to have again been sold at 9d. per gallon in the North; but the market closes rather easier for this quality, and there are sellers at 8¾d. for early shipment. In toluol, an offer of 7½d. for prompt delivery was declined by London refiners, who quote 8d., which price, however, consumers decline to pay. The demand for solvent still continues good, and there is a fair inquiry for delivery over the first six months of next year. The position of anthracene remains unchanged; and there is really nothing whatever doing in this article. Consumers do not care to pay more than 1½d. per unit for "A" quality, 40 per cent., which price makers decline to accept. As regards "B" quality, this is practically unsaleable; and makers as a rule are abandoning the production of same. The market continues strong in carbolic acid; and the demand is very good, especially for early delivery. Business is reported in 60's. at 2s. 4d. and 2s. 4½d. for prompt; while for January-June next year 2s. 3d. is reported to have been paid in more than one instance. Crystals are decidedly firmer; and there is an improvement all round. Makers continue to quote 7d. per lb. for 39-40 per cent.; but a fair business was done early in the week at 6½d., at which price there are still buyers for early delivery. In creosote, so far as London is concerned, makers maintain their prices; but the demand

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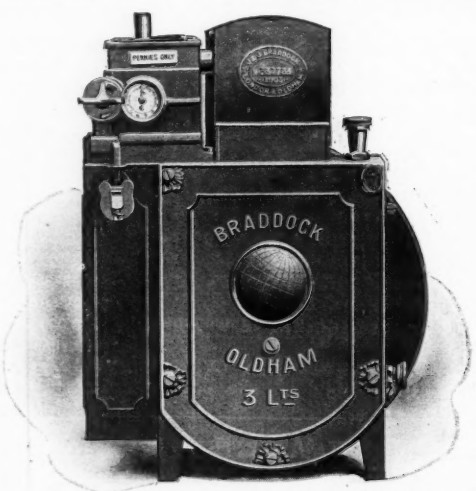
STRONG. DURABLE. SIMPLE. ACCURATE.

POSITIVE GEARING ENSURING RELIABILITY.

With Improved Cash Box made in one piece and removable either frontways or sideways, as convenient.

DETACHABLE ATTACHMENTS.

NO DELICATE PARTS.



No. 250. BRADDOCK'S CAST-IRON CASE WET PREPAYMENT METER.

By the Patent Crown Change Wheel the price may be most readily and positively altered *in situ*.

Any number of Feet per Penny may be allowed.

ABSOLUTELY THE MOST CONVENIENT AND CHEAPEST SYSTEM IN PRACTICAL USE.

NO FINE WHEELS.

J. & J. BRADDOCK (BRANCH OF METERS LIMITED), Globe Meter Works, OLDHAM.

Telegrams: "BRADDOCK, OLDHAM." National Telephone No. 254.

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Telegrams: "METRIQUE, LONDON." Telephone No. 248 HOP.

for export is scarcely so good as was the case a short time ago, doubtless owing to the difficulty in obtaining barrels. In the North, there are actually buyers at 1¼d.; but makers decline to accept less than 1⅜d. for either prompt or forward delivery. Pitch continues firm, and there is a fair inquiry reported for delivery over the first six months of next year. London makers have again sold at 37s. 6d., and as a rule ask 38s. to 38s. 6d., which prices, however, consumers decline to pay. There is still a good inquiry for Yorkshire pitch from Belgium and the north of France, where this quality is very highly esteemed. In South Wales, there is still a fair inquiry over the first six months of 1905; but consumers are not at all disposed to pay the prices asked by dealers and makers.

The average values during the week were: Tar, 18s. 6d. to 22s. Pitch, London, 37s. to 37s. 6d.; east coast, 35s. to 35s. 6d.; west coast, 33s. 6d. to 35s. Benzol, 90 per cent., 10½d.; 50-90 per cent., 8½d. Toluol, 7½d. Crude naphtha, 3¼d.; solvent naphtha, 8½d. to 9½d.; heavy naphtha, 10d. Creosote, London, 1⅝d.; North, 1¼d. to 1⅜d. Heavy oils, 2¼d. Carbolic acid, 60 per cent., 2s. 3d. to 2s. 4d. Refined naphthalene, £4 to £9; salts, 20s. to 21s. 6d. Anthracene, "A" quality, 1½d. to 1⅝d.; "B" quality, unsaleable.

Sulphate of Ammonia.

This article continues very firm; and there is a strong demand for forward delivery. The Gaslight and Coke Company still decline to sell; but their nominal quotation may be taken as £13 5s. for December-January. The South Metropolitan Company are reported to have sold at £13 7s. 6d. for December-January on their own special terms; and it is stated that they could have placed a further quantity at this price, but are now out of the market for the present. Business in Hull was done at £12 16s. 3d.; but makers now ask £12 17s. 6d. for prompt, while sales are reported for January-March at £13. In Leith, makers report business at £13 to £13 2s 6d. for prompt; but for January-June they still decline to quote, although there is a very strong inquiry over these months.

COAL TRADE REPORTS.

Lancashire Coal Trade.

The demand for house coal has been decidedly better; the recent severe weather having gladdened the hearts of the miners and gratified the minds of masters and merchants. Just, however, as colliery proprietors were within an ace of increasing prices, the frost and snow disappeared, and the weather became milder, with the result that it is not likely the expected advance will be put forward. Full time is being worked at the pits. The demand for engine and forge coal is steady; slack being taken away as fast as it is made. The shipping trade, too, is of a satisfactory character. Gas coal and cannel are also steady. Average prices remain the same as last week's quotations.

Northern Coal Trade.

There has been a fuller demand for coal in the last few days; stocks having been reduced during the period of stormy weather. In the steam coal trade, collieries have business enough to keep fairly at work, quite as much as is usual at this time of the year. Best Northumbrian steam coals are 9s. per ton f.o.b., second-class steams are 8s. to 8s. 3d., and steam smalls are firm at from 4s. to 4s. 6d. Manufacturing coal is steady in consumption; but prices are slightly less for next year's contracts. The large requirements for railway purposes for next year are now being negotiated; and it is probable that the prices will be from 3d. to 6d. per ton below those that have been paid under the expiring contracts. Gas coals are now at the time of fullest demand, and deliveries on the long contracts are heavy; but they seem to be well met at present. There are, however, only limited quantities of Durham gas coals being sold for export next year. The general quotations for good Durham gas coals are from 7s. 9d. to 8s. 4½d. per ton f.o.b., according to class and quantity; but the opinion of some sellers is that higher values may rule soon, as the demand for coal seems to be increasing. Coke is firmer; but the abundance of gas coke makes it easier with some of the companies who have not contracts for export to take up much of the output.

Scotch Coal Trade.

There is, if anything, a better demand for coal, due chiefly to the clearing out of stocks during the cold weather, and partly to the large deliveries to gas-works on account of foggy weather. Prices are consequently ruling higher. The quotations are: Main 7s. 3d. to 7s. 6d. per ton f.o.b. Glasgow, ell 8s. 3d. to 9s. 3d., and splint 8s. 6d. to 9s. The shipments are down, on account of the fog. The quantity for the week amounted to 217,416 tons—a decrease of 10,674 tons upon the preceding week, and of 5638 tons upon the corresponding week of last year. For the year to date, the total shipments have been 10,633,310 tons—an increase of 353,929 tons upon the same period of last year.

TRADE NOTES.

West's Coke-Conveyor.

The West's Gas Improvement Company, Limited, have recently received a contract from the Bath Gaslight and Coke Company for a complete installation of their hot-coke conveying machinery; the contract comprising two longitudinal retort-house conveyors, one conveyor from the longitudinal conveyors to the coke yard, and coke hoppers, a series of coke storage hoppers, and revolving circular screens for screening the coke to three sizes. The firm have also in hand contracts for installing the same form of coke-conveyor at the Bromley works of the Gaslight and Coke Company, the Rossendale Union Gas Company's works (this being a considerable extension of the installation recently put in at these works), and the new Valby Gas-Works,

CARBURETTED WATER-GAS APPARATUS

Merrifield—Westcott—Pearson Patents.

The Economical Gas Apparatus Construction Co., Ld.

W. H. PEARSON, Chairman.
W. H. PEARSON, Junr., Deputy-Chairman.
J. T. WESTCOTT, Manager.
L. L. MERRIFIELD, M.Inst.M.E., Engineer.

London Offices: 19, ABINGDON STREET, WESTMINSTER, S.W.
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CARBURETTED WATER-GAS ENGINEERS.

The above Company have erected since 1893, or are now erecting, their Universal Type of Carburetted Water-Gas Plant at the following Gas-Works:—

	Cub. Ft. Daily.		Cub. Ft. Daily.		Cub. Ft. Daily.
BLACKBURN	1,250,000	ST. CATHERINES (Remodelled)	250,000	TONBRIDGE	300,000
WINDSOR ST. WORKS, BIRMINGHAM	2,000,000	KINGSTON, PA.	125,000	STRETFORD	500,000
SALTLEY WORKS, BIRMINGHAM	2,000,000	PETERBOROUGH, ONT.	250,000	OLDBURY	300,000
COLCHESTER	300,000	WILKESBARRE, PA.	750,000	TODMORDEN	500,000
BIRKENHEAD	2,250,000	ST. CATHERINES (2nd Cont)	250,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
SWINDON (New Swindon Gas Co.)	120,000	BUFFALO, N.Y.	2,000,000	YORK (Second Contract)	750,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	WINNIPEG, MAN.	500,000	ROCHESTER (Second Contract)	500,000
WINDSOR ST., BIRMINGHAM (Second Contract)	2,000,000	COLCHESTER (Second Contract)	300,000	NEWPORT (MON.)	250,000
HALIFAX	1,000,000	YORK	750,000	TOKIO, JAPAN	1,000,000
TORONTO	250,000	ROCHESTER	500,000	PERNAMBUCO (Brazil)	125,000
OTTAWA	250,000	KINGSTON, ONT.	300,000	MALTON	150,000
LINDSAY (Remodelled)	125,000	CRYSTAL PALACE DISTRICT	2,000,000	DULUTH, MINN. (2nd Cont.)	300,000
MONTREAL	500,000	DULUTH, MINN.	300,000	BROCKVILLE (ONT.)	250,000
TORONTO (Second Contract Remodelled)	2,000,000	CATERHAM	150,000	SMETHWICK	500,000
BELLEVILLE	250,000	LEICESTER	2,000,000	GRAVESEND	300,000
OTTAWA (Second Contract)	250,000	ENSCHEDE (HOLLAND)	150,000	NEWPORT MON. (Second Contract)	250,000
BRANTFORD (Remodelled)	200,000	BUENOS AYRES (RIVER PLATE CO.)	700,000	TORONTO (Third Contract)	750,000
		BURNLEY	1,500,000	TORONTO (Fourth Contract)	1,000,000
		KINGSTON-ON-THAMES	1,750,000	MONTREAL, ONT. (2nd Cont.)	1,800,000
		ACCRINGTON	500,000	HAMILTON, ONT.	400,000

LEEDS, 1,800,000 C. Ft. LEICESTER (2nd Cont.), 1,000,000 C. Ft. NEWCASTLE-ON-TYNE, 1,800,000 C. Ft.

AND, IN ADDITION, 5,300,000 CUBIC FEET DAILY; also Coal-Gas Plants at NELSON, B.C., CHATHAM, BERLIN, NAPANEE, OWEN SOUND, CALGARY, and WINNIPEG.

Copenhagen, where the conveyors are to be laid down in a retort-house containing 32 through regenerator settings. It is interesting to learn that the original chain supplied with the first installation of this form of coke-convevor at the Blackpool Gas-Works has now been working continuously for the past two-and-a-half years, and has still a considerable life before it.

Milbourne's Patent Valves.

Messrs. C. & W. Walker, Limited, of Donnington, have received an order for eight Milbourne's patent outside valves, 16 inches diameter, suitable for working a set of four luteless purifiers, to be erected at the Reading Gas-Works. The steel covers of these purifiers are to be fitted with Milbourne's patent automatic rapid fasteners, by which system the locking or releasing of the whole of the clutches on each of the four sides of the cover is effected by one simple operation, practically instantaneously. The whole of this work has been designed, and will be carried out under the supervision of, Mr. Douglas H. Helps, the Engineer to the Reading Gas Company. Milbourne's outside valves are also being supplied by Messrs. Walker for four purifiers now being erected by Messrs. Cutler and Sons for the Winchester Water and Gas Company. These boxes will be fitted with the Jäger patent grids; but the Milbourne valves were adopted as being, it is stated, "more convenient than any other outside valve arrangement for working with these grids." Seven large purifiers, 40 ft. long by 35 ft. wide by 6 ft. deep, with 24-inch connections, were erected over twelve months ago by Messrs. Walker at the new Etruria Gas-Works of the British Gaslight Company. The boxes are worked in two sections—as a set of four, with a set of three following them; and these are all fitted with Milbourne's outside valves.

Manchester Gas Supply.—The make and consumption of gas at Manchester during November the past three years were as follows: 1902: Make, 521,670,000 feet; consumption, 516,604,000 feet. 1903: Make, 545,653,000 feet; consumption, 543,892,000 feet. Increase over 1902: Make, 4·60 per cent.; consumption, 5·28 per cent. 1904; Make, 558,005,000 feet; consumption, 561,819,000 feet. Increase over 1903: Make, 2·26 per cent.; consumption, 3·30 per cent. Thus in spite of the extraordinary fogs of recent date, there was not an abnormal demand upon the works during the past month.

Scott-Snell Lamps in Westminster.—Last Wednesday, the Works Committee of the Westminster City Council reported that a suggestion had come from the Receiver and Manager of the Scott-Snell Self-Intensifying Gas-Lamp Company that the Municipality should take over, for a payment of £25, and maintain, the sample lamps erected at the corner of Great Chapel Street and on a refuge in the Broad Sanctuary. The Committee could not see their way to adopting this proposal, as the lamps are on a different system from those in the near neighbourhood. The Company will thus have to remove the lamps.

Rochdale and the Todmorden Water Supply.—The Rochdale Town Council, on the recommendation of the Water Committee, have decided to accept £18,000 as the price to be paid them for the water-mains and apparatus in Todmorden. In the Act of 1898 by which Rochdale secured the Ramsden works, it was provided that when the Corporation of Todmorden supplied themselves from their new reservoir at Gorpley, they should acquire (by agreement or arbitration) the street mains, &c., within their own borough; and the reservoir is now approaching completion. The loss of the supply to Todmorden will entail on Rochdale a reduction of revenue amounting to over £2000 a year.

Reported Sacrifice of Life by Gas Poisoning in New York.—On Monday last week, the New York correspondent of the "Daily Express" telegraphed as follows: "Three hundred deaths are said to have been caused in the east side tenement districts by the gas supply of New York. Investigation shows that the gas used for ordinary illuminating and heating purposes contains a poisonous quality which speedily causes coma and death. Twenty-one deaths, which occurred last week in various parts of the city, are directly attributable to this gas. The newspapers are demanding a thorough investigation. Many persons have been killed by inhaling the gas, even when the windows of the room were wide open."

Explosions in Electric Street-Boxes.—Two explosions occurred at about the same hour on Thursday at Blackburn. Underground electric cables fused, with the result that a cable manhole cover in Lord Street was blown some 4 or 5 feet into the air. The fusing also melted some gas-pipes, and a large escape of gas followed, but fortunately without causing serious damage. Early last Saturday morning, the inhabitants of Bermondsey were aroused by the report of an explosion which proceeded from the direction of Bermondsey Street. On the arrival of the fireman on the spot, they found flames issuing from an electric light manhole; and steps were at once taken to have the current switched off. Sand was thrown on the flame, and it was eventually subdued. The cause of the explosion was a short-circuit.

Sales of Shares.—At the Mart, Tokenhouse Yard, E.C., last Tuesday, Mr. Alfred Richards placed, by order of the Directors, a new issue of ordinary "C" stock of the Wandsworth and Putney Gas Company. The stock ranks for a standard dividend of 3¾ per cent., subject to the sliding-scale; the last dividend on the existing "C" stock having been at the rate of £5 8s. 6d. per cent. per annum. The nominal amount of the new issue was £10,000; and it was all sold at from £114 to £115 per £100—yielding, at the average price of £114 1s. 2d., £4 15s. 1d. on the investment. At Otley, last week, Messrs. Dacre and Son sold by auction a new issue of £3000 of ordinary stock in the Otley Gas Company. The stock (which ranks for a standard dividend of 5 per cent., and is now receiving 5½ per cent.) was sold in lots of £100 each; and the prices realized ranged from £126 to £128 10s. On the last occasion when similar stock was sold, it fetched about £115 per £100.

MILBOURNE'S

PATENT LUTELESS

PURIFIERS

SAVE

GAS, GROUND SPACE, & CONNECTIONS.

ERECTED OR IN HAND AT THE FOLLOWING GAS-WORKS:

WREXHAM, DORKING, MITCHAM, RUGBY, EVESHAM, BOLOGNA (ITALY), SEDGELEY, VALPARAISO (CHILI), BANGOR (IRELAND), DRAYCOTT, BRITISH GAS COMPANY (ETRURIA STATION), STRATFORD-ON-AVON, KIDDERMINSTER, KETTERING, NORTH MIDDLESEX, &c., &c.

SOLE MAKERS—

C. & W. WALKER, LTD.,

Midland Iron Works:
DONNINGTON, NEWPORT, SALOP.

London Office:
110, CANNON STREET, E.C.

Gas versus Electricity at Ryde.—Some time ago we referred to an experimental installation of Lucas lights at the Ryde Town Hall, in connection with which Mr. F. Farrand, the Gas Manager, had demonstrated his recently invented system of long-distance lighting. The battle which this installation has occasioned was (as announced in last week's "JOURNAL") brought to a temporary close by the decision of the Council to adopt the Lucas light for the large Town Hall, while reserving the Council Chamber for its electric competitor. The result must be gratifying to Mr. Farrand and all friends of gas lighting—especially as it has been achieved in the teeth of determined opposition. The controversy was marked by a fair selection of the gratuitous statements which usually adorn such debates; and some members did not fail to insist that electric lighting was really cheaper than gas—actual experience notwithstanding. One gentleman, a correspondent writes, had evidently been careless enough to stare too protractedly at the powerful gas lights; and, as a result, he did not hesitate to assure the Council that the Lucas light would give them head-ache. Only four members could be found to oppose the Lucas light for the large hall; and it is presumably only a question of time when prejudice will be unable to bar its further adoption by the Council.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

ESTIMATING AND DESIGNING ENGINEER. No. 4296.
TRAVELLER. No. 4305.
DRAUGHTSMAN. No. 4303.
ASSISTANT SUPERINTENDENT OF MAINS AND FITTINGS. No. 4306.
DISTRIBUTION AND MAINTENANCE DEPARTMENT. Great Yarmouth Gas Company.
WORKING FOREMAN. No. 4304.

Patent Rights for Disposal. Redman and Co., Bradford.

Plant for Sale.

PUMPING ENGINE AND WELL PUMP. Birmingham Water Department.

Purifying Water from Sulphate Still. Particulars Required. No. 4295.

Stocks and Shares.

COMMERCIAL GAS COMPANY. Dec. 29.
CITY OF NORWICH WATER COMPANY. Dec. 31.

TENDERS FOR

Tar and Ammoniacal Liquor.

BRIDGEWATER COLLIERIES COKE WORKS. Tenders by Dec. 19.
SHOTLEY BRIDGE AND CONSETT GAS COMPANY. Tenders by Dec. 8.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 766.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
590,000	10	Oct. 13	10⅓	Alliance & Dublin 10 p.c.	20½—21⅓	..	4 17 8
100,000	10	,,	7⅓	Do. 7 p.c.	13—14	..	5 7 2
200,000	5	Nov. 11	6⅔	Bombay, Ltd.. . . .	6—6⅓	..	5 0 0
140,000	5	,,	6⅔	Do. New, £4 paid	4⅓—5	..	5 4 0
50,000	10	Aug. 31	14	Bourne-) 10 p c. . .	29—30	..	4 13 4
251,810	10	,,	7	mouth Gas) B 7 p.c. .	15½—16½	..	4 4 10
53,200	10	,,	6	and Water) Pref. 6 p.c.	14⅓—15⅔	..	3 17 5
380,000	Stk.	Aug. 12	12	Brentford Consolidated	245 250	+3	4 16 0
300,000	,,	,,	9	Do. New . . .	187—192	+2	4 13 9
50,000	,,	,,	5	Do. 5 p.c. Pref. .	125—130	..	3 16 11
206,250	,,	June 10	4	Do. 4 p.c. Deb. .	104—107	..	3 14 9
220,000	Stk.	Sept. 15	11	Brighton & Hove Orig.	220—225	+2	4 17 9
246,320	,,	,,	8	Do. A. Ord. Stk. .	162—167	+2	4 15 10
460,000	20	Sept. 29	10	British	40—41	..	4 17 7
100,000	Stk.	Aug. 12	6	Bromley, Ord. 5 p.c. .	117—122	..	4 18 4
165,700	,,	,,	4⅔	Do. do. 3½ p.c. .	92—93	..	4 13 9
500,000	10	Oct. 13	7	Buenos Ayres (New) Ltd.	11⅛—11⅜	..	5 19 2
250,000	Stk.	June 29	4	Do. 4 p.c. Deb. .	95—97	+1	4 2 6
150,000	20	July 14	8¼	Cagliari, Ltd.	22—24	..	6 17 6
100,000	10	Sept. 29	10	Cape Town & Dis., Ltd.	14⅝—15¼	+⅛	6 11 2
100,000	10	Oct. 27	4⅓	Do. 4½ p c Pref. .	9¼—9⅜	..	4 12 4
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	51—53	..	5 13 2
50,000	Stk.	June 29	4½	Do. 4½ p.c. Deb. Stk.	100—102	+1	4 8 3
1,375,000	Stk.	Aug. 31	5⅛	Commercial 4 p.c Stk. .	110—112	..	4 12 10
560,000	,,	,,	5	Do. 3½ p.c. do. .	106—108	..	4 12 7
450,000	,,	June 10	3	Do. 3 p.c. Deb. Stk.	86—88	..	3 8 2
800,000	Stk.	June 10	6¼†	Continental Union, Ltd.	104—107	+1	6 1 6
200,000	,,	,,	7	Do. 7 p c. Pref.	135—140	..	5 0 0
486,090	10	July 14	11	European, Ltd. . . .	20—21	+½	5 4 9
354,060	10	,,	11	Do. £7 10s. paid	14—15	..	5 10 0
15,243,200	Stk.	Aug. 12	4⅛	Gas-) 4 p.c. Ord. . .	97—99	..	4 8 10
2,600,000	,,	,,	3½	light) 3½ p.c. max. .	90—92	..	3 16 1
3,799,735	,,	,,	4	and) 4 p.c. Con. Pref.	108—110	..	3 12 9
4,193,975	,,	June 29	3	Coke) 3 p.c. Con. Deb.	87—89	..	3 7 5
258,740	Stk.	Sept. 15	5	Hastings & St. L. 3½ p.c.	90—95	..	5 5 3
70,000	10	Sept. 29	11	Hongkong & China, Ltd.	15—16	..	6 17 6
3,800,000	Stk,	Nov. 11	10	Imperial Continental .	205—207	−1	4 16 7
473,600	Stk.	Aug. 12	3½	Do. 3½ p.c. Deb. Red.	96—98	..	3 11 4
175,036	Stk.	Aug. 31	6	Lea Bridge Ord. 5 p.c. .	117—122	+2	4 18 4
561,000	Stk.	Aug. 31	10	Liverpool United A . .	218—220	..	4 10 11
718,100	,,	,,	7	Do. do. B . .	159—161	..	4 6 11
306,083	,,	June 29	4	Do. do. Deb. Stk.	107—109	..	3 13 5
£							
75,000	5	June 29	5	Malta & Medn., Ltd. .	4¼—4⅜	..	5 5 3
560,000	100	Oct. 1	5	Met. of) 5 p.c. Deb..	102—104	..	4 16 2
250,000	100	,,	4⅓	Melbourne) 4⅓ p.c. Deb.	100—102	..	4 8 3
541,920	20	Nov. 11	3⅓	Monte Video, Ltd. . .	10—11	..	6 7 3
1,515,892	Stk.	July 29	4⅓	Newc'tle & G'tesh'd Con.	108—110	+1	4 1 10
406,125	Stk	July 1	3⅓	Do. 3½ p.c. Deb.	92—92½	..	3 15 8
15,000	10	Aug. 31	10	North Middlesex 10 p.c.	19½—20½	..	4 17 7
52,940	10	,,	7	Do. 7 p c.	13½—14½	..	4 16 7
300,000	Stk.	Nov. 30	8	Oriental, Ltd.	144—148*	+1	5 8 1
600,000	5	Sept. 15	7	Ottoman, Ltd. . . .	5½—6½	..	5 12 0
235,005	Stk.	—	6½	Plym'th & St'house 5 p.c.	—	..	—
398,490	5	Apl. 28	5	Primitiva Ord.	5½—6	..	4 3 4
796,980	5	July 28	5	Do. 5 p.c. Pref. .	4⅔—5⅔	+⅛	4 5 3
488,900	10	Dec. 1	4	Do. 4 p.c. Deb. .	92—94*	+1	4 5 1
851,070	10	Oct. 13	7	River Plate Ord. . . .	11⅛—11⅜	..	5 16 8
300,000	Stk.	June 29	4	Do. 4 p.c. Deb. .	95—97	+1	4 2 6
250,000	10	Sept. 15	6	San Paulo, Ltd. . . .	12—12⅛	..	4 16 0
70,000	50	June 29	5	Do. 5 p.c. Deb. .	51—53	..	4 14 4
135,000	Stk.	Sept. 15	10	Sheffield A	238—240	+1	4 3 4
209,984	,,	,,	10	Do. B	237—239	..	4 3 8
523,498	,,	,,	10	Do. C	236—238	..	4 4 0
123,998	Stk.	Sept. 29	5	Shrewsbury Ord. 5 p.c.	104½—107½	..	4 13 0
70,000	10	,,	11	South African	16—17	..	6 9 5
6,250,000	Stk.	Aug. 12	5½	South Met., 4 p.c. Ord.	129—131	+1	4 4 0
1,832,700	,,	July 14	3	Do. 3 p.c. Deb.	88—90	..	3 6 8
575,000	Stk.	Aug. 31	5½	S'th Suburb'n Ord. 5 p.c.	122—125	+1	4 8 0
60,000	,,	,,	5	Do. 5 p.c. Pref. . .	120—.25	..	4 0 0
112,533	,,	July 14	5	Do. 5 p.c. Deb. Stk.	133—138	..	3 12 6
502,310	Stk.	Nov. 11	5	Southampton Ord. . .	103—107	..	4 13 6
87,950	,,	—	4	Do. 4 p.c. Deb.	—	..	—
120,000	Stk.	Aug. 31	6¼	Tottenham) A 5 p c. .	122—127	..	4 18 5
325,520	,,	,,	4¼	and) B 3½ p.c. .	97—102	..	4 13 2
115,000	,,	June 29	4	Edmonton) 4 p.c. Deb.	104—107	..	3 14 9
182,380	10	June 10	8	Tuscan, Ltd.	8½—8⅔	..	9 2 10
149,900	10	July 1	5	Do. 5 p c. Deb. Red.	96—98	..	5 2 0
30,000	Stk.	Aug. 31	7⅔	Wands-) A 5 p.c. . .	160—165	+5	4 13 11
255,636	,,	,,	6¼	worth) B 3½ p.c. . .	130—135	+7	4 12 7
51,293	,,	,,	5 7/10	and) C 3½ p.c. . .	110—115	+5	4 13 6
57,564	,,	June 29	3	Putney) 3 p.c. Deb. Stk.	78—83	..	5 12 8
745,872	,,	Aug. 12	5	West Ham 5 p.c. Ord.	99—101	..	4 19 0
85,000	,,	,,	5	Do. 5 p.c. Pref. . .	117—122	..	4 2 0
160,000	,,	June 29	4	Do. 4 p.c. Deb. Stk.	103—108	..	3 14 1

Prices marked * are Ex div. † Next dividend will be at this rate.

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O'NEILL'S OXIDE has a larger annual sale than all other Oxides combined.

SPENT OXIDE purchased in any district.

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"VOLCANIC" FIRE CEMENT.

Resists 4500° Fahr. Best for GAS-WORKS.

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BROTHERTON AND CO., LTD., Tar Distillers. Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, AND WAKEFIELD.

"NUGEPE" CEMENT.

JOHN E. WILLIAMS AND CO.,

VICTORIA PAINT WORKS, MANCHESTER.

For all Joints in connection with Oil-Gas Plant and Sulphate Plant.
For all Gas Joints.
For all Tar Joints.
For all Ammonia Joints.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 45 & 47, Westminster Bridge Road, LONDON, S.E. WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS, AND GOVERNORS. REPAIRS RECEIVE PROMPT ATTENTION.

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THE First Dutch Bog Ore Co., Ltd., (Eerste Hollandsche Yzererts Maaty), ROTTERDAM.

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SPECIALLY prepared for the Manu- facture of SULPHATE OF AMMONIA.

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SHARPNESS CHEMICAL COMPANY, LIMITED, Sharpness Docks, GLOS.

HYDRATED OXIDE OF IRON.

PREPARED from Pure Iron.

Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Exchanged for Spent Oxide.

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We guarantee promptness, with efficiency for Repairs.
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BROTHERTON AND CO., LTD., Ammonia Distillers.
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THE South Metropolitan Gas Company are always open to receive OFFERS of SPENT OXIDE.
Chief Office: 709, Old Kent Road, London, S.E.
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OVER 1600 INSTALLATIONS IN DAILY USE.
SEE illustrated advertisement in next week's issue.
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THE HANWELL PATENT RISING & FALLING GAS PENDANT (as described in the JOURNAL for Nov. 22, p. 599), can be seen at the Gas Exhibition, STAND No. 154, Queen's Palace.
THE HANWELL PENDANT COMPANY, Abington Street, NORTHAMPTON.

WANTED, a Working Foreman, accustomed to Making, Assembling, and Testing High-Class Burners, Fittings, and Gas Apparatus.
Apply, giving full Particulars of past Experience, to No. 4304, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Competent Draughtsman, Age 25 to 30, Experienced in Light Machinery, Gas-Meters, and Gas-Testing Apparatus.
Apply, giving full Particulars of Experience and Salary required, to No. 4303, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

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Apply, by letter, stating full Particulars and district covered, to No. 4305, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by the Great Yarmouth Gas Company, an ENERGETIC MAN to work under the Superintendence of the Distribution Department, and to undertake Maintenance of Incandescent Burners, to visit Consumers, and to advise as to the best methods of using Gas.
Applicants must be Experienced in all modern types of Incandescent Burners, Cooking, and Heating Stoves.
Applications, stating present Employment, Age, Experience, and Wages required, accompanied by *copies* of Two recent Testimonials, to be sent to the CHAIRMAN of the Company, Gas Offices, GREAT YARMOUTH.

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RETORTS.—Something new in Retorts and their charging, which will do away with many of the disadvantages of the present inclined and vertical systems, and which will also include many advantages hitherto unheard of. They save capital expenditure, gas, time, and labour. They are equally adaptable to medium and small, as well as to large works.
See our advertisement on page 794.
T. REDMAN & Co.
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WANTED, An Assistant-Superin- tendent of Mains and Fittings for a Gas Company abroad. Climate, Temperate and Healthy.
Apply, by letter, to No. 4306, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ANYONE able to supply details of a COMMERCIALLY SUCCESSFUL method for purifying the Waste Gas Water from a Sulphate Still will find it to his advantage to communicate with No. 4295, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

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Apply, by letter, stating Qualifications, Age, Salary, and when at liberty, to No. 4296, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

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GAS and Water Works Supplies and Construction Company, Limited, are open to purchase small or large Gas-Works. Constructors for all Gas and Water Work and Main Laying. All Gas and Water Works Plant and Fittings supplied. Gas and Water Works Financed. Shares and Stock accepted in part payment for Work and Materials supplied. Gas and Water Works Shares and Stock Underwritten and Issued.
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BRIDGEWATER COLLIERIES COKE WORKS.
(THE EARL OF ELLESMERE).

TENDERS are invited for the Tar pro- duced at the above Works for a period of Six or Twelve Months from the 1st of January, 1905, delivered into Contractor's Tanks at the Bridgewater Colliery siding, Warton Hall, on the Pendleton and Hindley branch of the Lancashire and Yorkshire Railway; or at the Brackley siding, Little Hulton Mineral branch of the London and North Western Railway.
The estimated quantity is 2500 Tons per annum.
Tenders, endorsed "Tender for Tar," to be addressed to Mr. Thomas M. Brown, Bridgewater Coal Offices, 4, Chapel Walks, Manchester, on or before the 19th of December.
Manchester, Nov. 19, 1904.

NEW Gasholder, 40 ft. diameter by 12 ft. deep, with Steel Standards; also new STEEL TANK to contain same.
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TENDER FOR TAR.

THE Directors of this Company invite TENDERS for the purchase of the TAR to be produced at their Works for the Year 1905. Quantity about 70,000 Gallons. The Contractor to find his own Casks and to accept delivery at Blackhill Station.
Tenders to be sent to the undersigned not later than Thursday, Dec. 8.
M. RICHLEY, Secretary.
Gas Office, Shotley Bridge,
Nov. 26, 1904.

THE GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that the TRANSFER BOOKS of this Company, so far as they relate to Debenture Stock and Bonds, WILL BE CLOSED at One o'clock p.m. on Saturday, the 10th prox., for the Half Year ending on the 31st prox., and will be REOPENED on the morning of Monday, the 12th prox.
The Interest for the Half Year will be payable on the 2nd of January next to the proprietors registered on the closing of the Books.
By order,
HENRY RAYNER,
Secretary.
Chief Office, Horseferry Road,
Westminster, S.W., Nov. 28, 1904.

TOTTENHAM AND EDMONTON GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that the TRANSFER BOOKS of the Company, so far as they relate to DEBENTURE STOCK, WILL BE CLOSED at Ten o'clock in the forenoon on Friday, the 9th of December, for the Half Year ending the 31st of December, 1904, and will be RE-OPENED on Friday, the 16th of December.
The Interest for the Half Year will be payable on the 1st day of January next to the Proprietors registered on the closing of the Books.
By order of the Board,
JAMES RANDALL,
Secretary.
Chief Offices: 639, High Road,
Tottenham, Dec. 2, 1904.

CITY OF NORWICH WATER-WORKS COMPANY.
INCORPORATED BY THE CITY OF NORWICH WATER-WORKS ACT, 1850.

SALE BY TENDER OF 1000 £10 ORDINARY SHARES.

THE Directors invite Tenders (at not less than the value of £16 5s. per Share) for the purchase of 1000 ORDINARY £10 SHARES in the above-named Company. The Shares will be issued as fully paid, and will constitute a portion of the Additional Capital authorized to be raised under the powers and provisions contained in the City of Norwich Water-Works Act, 1898.
These Shares rank for a Maximum Dividend of 6 per cent. per annum, and the Dividends on similar Shares have for the last 13 Years been paid at the rate of 6 per cent. per annum.
Payment for the Shares is to be made on or before the 14th of January, 1905.
The Dividends are paid half-yearly, and will accrue from the 14th of January next.
Particulars, with Forms of Tender, may be obtained on application to the Secretary, to whom Tenders, marked "Tenders for Shares," must be delivered on or before the 31st of December next.
By Order of the Directors,
G. CHRISTOPHER DAVIES,
Secretary.
11, Prince of Wales Road,
Norwich, Nov. 14, 1904.

ISSUES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his ISSUES by AUCTION under PARLIAMENTARY POWERS of STOCKS and SHARES in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.
Terms for Issuing such Capital, and also for including Gas and Water Stocks and Shares belonging to Private Owners in these Periodical Sales, can be obtained on application at MR. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

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ISSUE OF FOUR PER CENT. (NOMINAL) CAPITAL STOCK.

MINIMUM PRICE, £110 PER £100 STOCK.

THE Directors of the Commercial Gas Company are about to issue a balance of £9595 FOUR PER CENT. CAPITAL STOCK; and they invite TENDERS for the same at prices not less than £110 per £100 Stock.

The Dividend upon this Stock is regulated by the Commercial Gas Act, 1902, whereby, for every penny per 1000 cubic feet by which the price of gas is reduced below the standard price of 3s. 3d., the Company are entitled to increase the 4 per cent. rate of dividend by 2s. 8d. The rate of dividend paid for the Half Year ending June 30, 1904 (when the price charged for gas was 2s. 6d. per 1000 cubic feet), was thus increased to £5 4s. per cent. Since that date, the Company have further reduced the price of gas to 2s. 5d. per 1000 cubic feet, which will authorize them to declare a dividend for the current Half Year at the rate of £5 6s. 8d. per cent.

The Company's Meetings are held in the months of February and August; and the dividends are paid on or about the 1st of March and the 1st of September. The Stock now offered will carry dividend as from the 1st of January, 1905. The liability of the Stock-holders is limited—that is, when the Stock is paid for there is no further liability whatever. The Stock will be issued in amounts of not less than £5, or multiples thereof, and will be registered in the names of the allottees (or their nominees) free of expense.

Tenders for Stock will be received not later than the 20th of December; and the balance of the purchase money is to be paid in full not later than the 29th of December, 1904.

Forms of Tender may be obtained from the Company's Bankers, the London City and Midland Bank, 52, Cornhill, E.C., or from the Secretary of the Company.

Commercial Gas Company's Office,
Harford Street, Stepney, E., Dec. 1, 1904.

Now Ready, Price 15s., Limp Cloth.

TWENTY-FOURTH YEAR.

AN

ANALYSIS OF THE ACCOUNTS

OF THE

METROPOLITAN WATER COMPANIES

(Chelsea, East London, Grand Junction, Kent, Lambeth, New River, Southwark and Vauxhall, and West Middlesex),

AND OF THE

ACCOUNTS OF SOME OF THE PRINCIPAL

PROVINCIAL WATER UNDERTAKINGS

FOR THE YEAR 1903-1904.

Compiled by

WOOD, DREW, & CO.,

Chartered Accountants.

LONDON:

WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

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PATENT

CANDLE SAFETY LAMPS.

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REGISTERED.

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Best Gas Coal and Cannel, giving High Illuminating Power, Large Yield per ton, and reasonable in Price.

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Sperm Value 878·85 lbs. per Ton.

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RAVENSTHORPE, NEAR DEWSBURY.

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AND SONS, LIMITED,

SHEAF WORKS, SHEFFIELD,

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FOR ENGINEERS.

STEEL OF ALL DESCRIPTIONS.

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INCANDESCENT

GAS LAMP.

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MANY DETAIL IMPROVEMENTS.

This Burner being positively Dust and Draught Proof, it prolongs the life of the Mantle and Saves its Cost in Maintenance.

See Testimonials.

SEE OUR EXHIBIT, STAND 41A, ANNEXE, GAS EXHIBITION.

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Maintains a High Standard in Residuals.

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Manufacturers of Incandescent Mantles.
Importers of all kinds of Fittings & Accessories.

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New and Second-Hand with all Accessories; also Tip Waggons and Turntables.

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ALFRETON IRON-WORKS, DERBYSHIRE,
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Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.,

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

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In almost every department additions have been made; and it is believed that the labour bestowed on its production will enhance the value of the book as a Work of Reference.

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Our **P-C** accomplishes this.

SEE OUR ADVERTISEMENTS NEXT WEEK.

Telegraphic Address: "ABBA, BRADFORD."

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THE Inventions enumerated below are valuable and worthy of the careful attention of all firms who desire to keep pace with the times with their plant. The Patent Rights are either for Sale outright, or may be worked on Licence, or we will on reasonable terms agree to their being manufactured and supplied by a Company to be formed for that object.

Washer-Scrubber.—The design of a new rotary Washer-Scrubber on the principle of the honeycomb cell. It has a larger scrubbing surface than anything yet produced, and is free from binding friction against the drive. It also embodies many other advantages necessary in a successful Washer-Scrubber.

Primary Cleanser.—A most perfect device arranged so as to arrest the greater part of the heavy impurities in crude gas before being conducted through any other device, thereby lessening the task of such apparatus, and consequently giving it a much longer period of action, and securing more thorough purification.

Note.—We are prepared to supply this Primary Cleanser without direct charge, taking payment by results and savings over an agreed period.

Hydraulic Main Valve.—A simple arrangement in one Valve, by which the seals to dip pipes are regulated as to depth, or removed, and also, when required, acts as a complete stop valve. All these manipulations are made with one movement and with but one moving part.

New Four-Way Valve.—This one Valve is capable of performing the following functions: Reverse motion, bye-pass, and complete double-faced stop, all combined and working with but one moving part. This Valve is applicable to the reversing of any single or combination of apparatus.

Centre Valve.—This Valve enables one to have all his four purifiers in work, and at any time to cut out for changing, and immediately to put into action again. It also, with the addition of one of the above four-way valves, enables one to reverse the whole bed of purifiers, thereby ensuring greater duty from the purifying material.

Retorts.—Something new in Retorts and their charging, which will do away with many of the disadvantages of the present inclined and vertical systems, and which will also include many advantages hitherto unheard of. They save capital expenditure, gas, time, and labour. They are equally adaptable to medium and small, as well as to large works.

Purifiers.—With new methods of revivification, *in situ* and otherwise, new methods of discharging, and also a new grid and grid bar, which secures an increased surface contact, even density, and increased capacity. With the combination of the above a purifier may be put through the whole cycle of operations of changing well within one-tenth part of the time of present practice, and with but a fraction of the labour hitherto required, and that without endangering either life or health. The above systems adapt themselves equally well to Tower Purifiers as advocated by eminent engineers in the United States and in the British Gas Publications of recent dates. With these arrangements we can surpass anything now on the market, for quantity of material in space, extended utility, and working results.

We intend to be in attendance, with models and drawings of the above, at a convenient address near to Earl's Court during the latter part of the Exhibition, and meantime invite all interested parties to communicate with us, as below, when we shall be pleased to arrange an appointment to inspect same with a view to business.

The Priory, Bradford. T. REDMAN & Co.

HISLOP'S PATENT RETORT SETTINGS.

The very best to adopt for Productive Capacity, Economy of Fuel, Durability, and Simplicity of Management.

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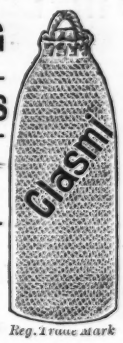
SHRINKLESS — UNIFORM



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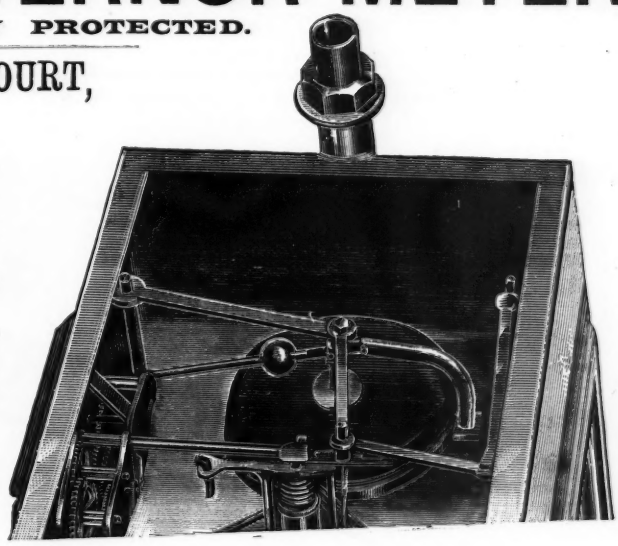
The problem of effective control of gas pressure at the measuring point has been greatly simplified by the introduction of this combined Meter and Governor, which can be readily adjusted to any desired pressure, according to varying conditions. The regulation of pressure is effected by the use of a key, which may be operated officially or by the consumer. The **additional cost** of Meters fitted with this self-contained Governor **is only a few Shillings** in the ordinary sized Meters, and this nominal expense removes the usual objection to the fixing of Gas Governors.



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Cliff's Patent Machine-Made Retorts possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made.

Retorts carefully Packed for Export.

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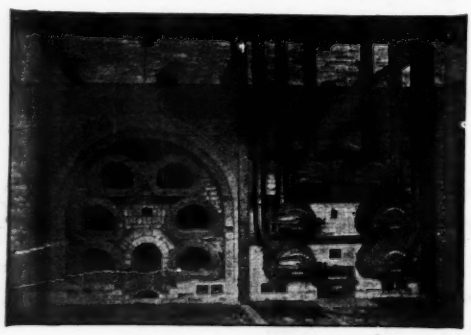

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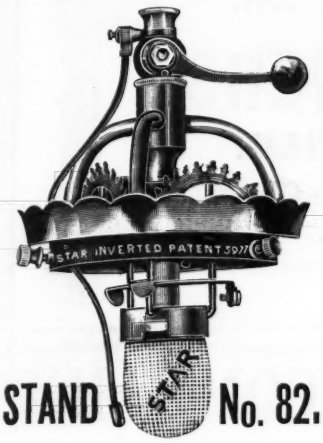

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the best that money can buy. For your own welfare, and the satisfaction of your customers, you cannot afford to be without

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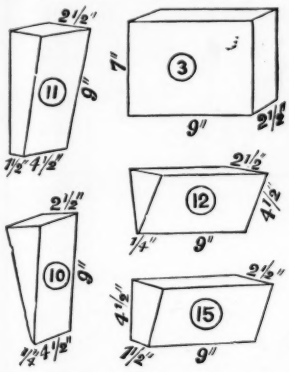

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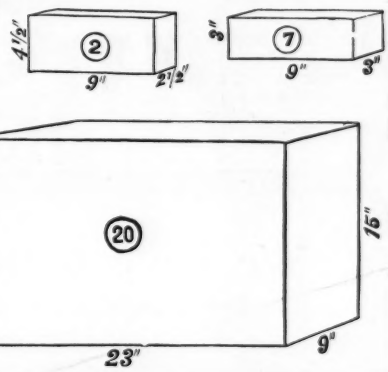

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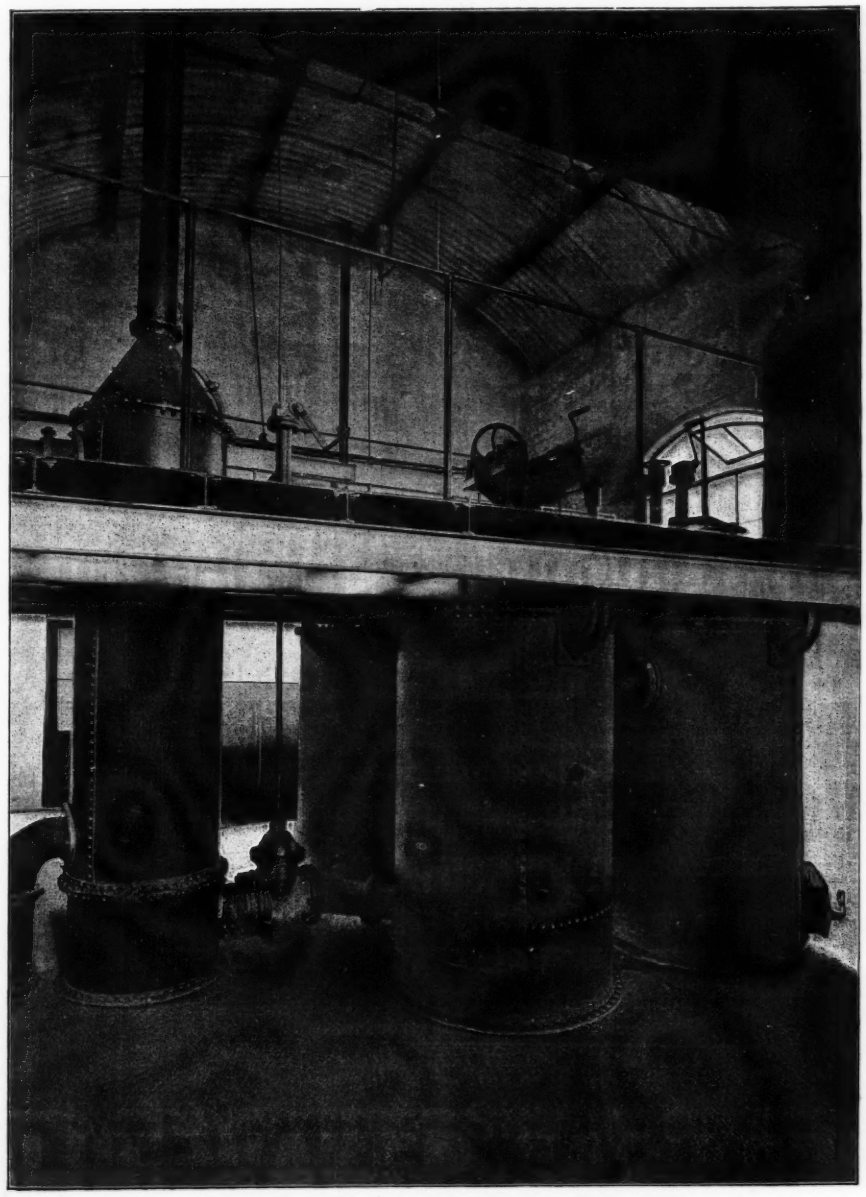
(DR. KRAMERS & AARTS PATENTS).



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Calorific Power, 315 B.T.U per cubic foot.

Use of Carbon in the Generators, 22 lbs.

Use of Steam in the Generators, 3·3 Gallons.

Percentage Composition:

CO_2	3·5
O_2	0·2
CO	45·0
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Difference	3·3

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Amsterdam - -	2,118,000
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We have Lighted a Section of Plymouth Docks
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An Extension has been Ordered. .

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The Council has unanimously decided that we be requested to do the whole of the Public Lighting.

We are

50 per cent. Cheaper than Incandescent Gas.
70 ,, Electric Arc.
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120 ,, Ordinary Fishtail.

BERLIN, the Finest Lighted City in the World, **has adopted Millennium**

It is the LAST WORD.

THE MILLENNIUM SYSTEM IS A METHOD OF COMPRESSING ORDINARY GAS. . . . .

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The British Compressed Gas Co., Ld.,

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PERFECTION
Incandescent gas Lighting
MAXIMUM LIGHT
MINIMUM HEAT
COMPLETE
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Simple

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What more do you want of a light? These qualities characterize the Lucas Light. Every lamp, intelligently treated, secures an enthusiastic friend. Our regulating nipple makes it child's play to secure the best results; our improved lanterns are tasteful, weatherproof, and well-made. Single or cluster lanterns, giving a range of lighting capacity from 200 to 2000 candles.

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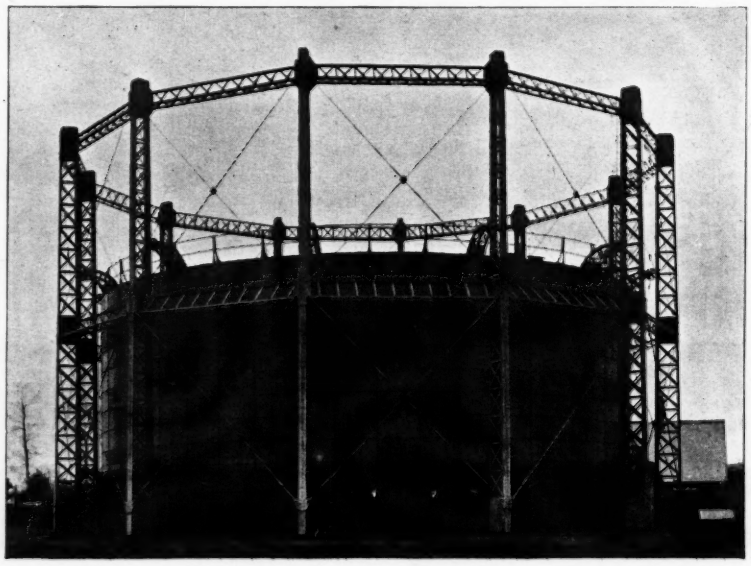

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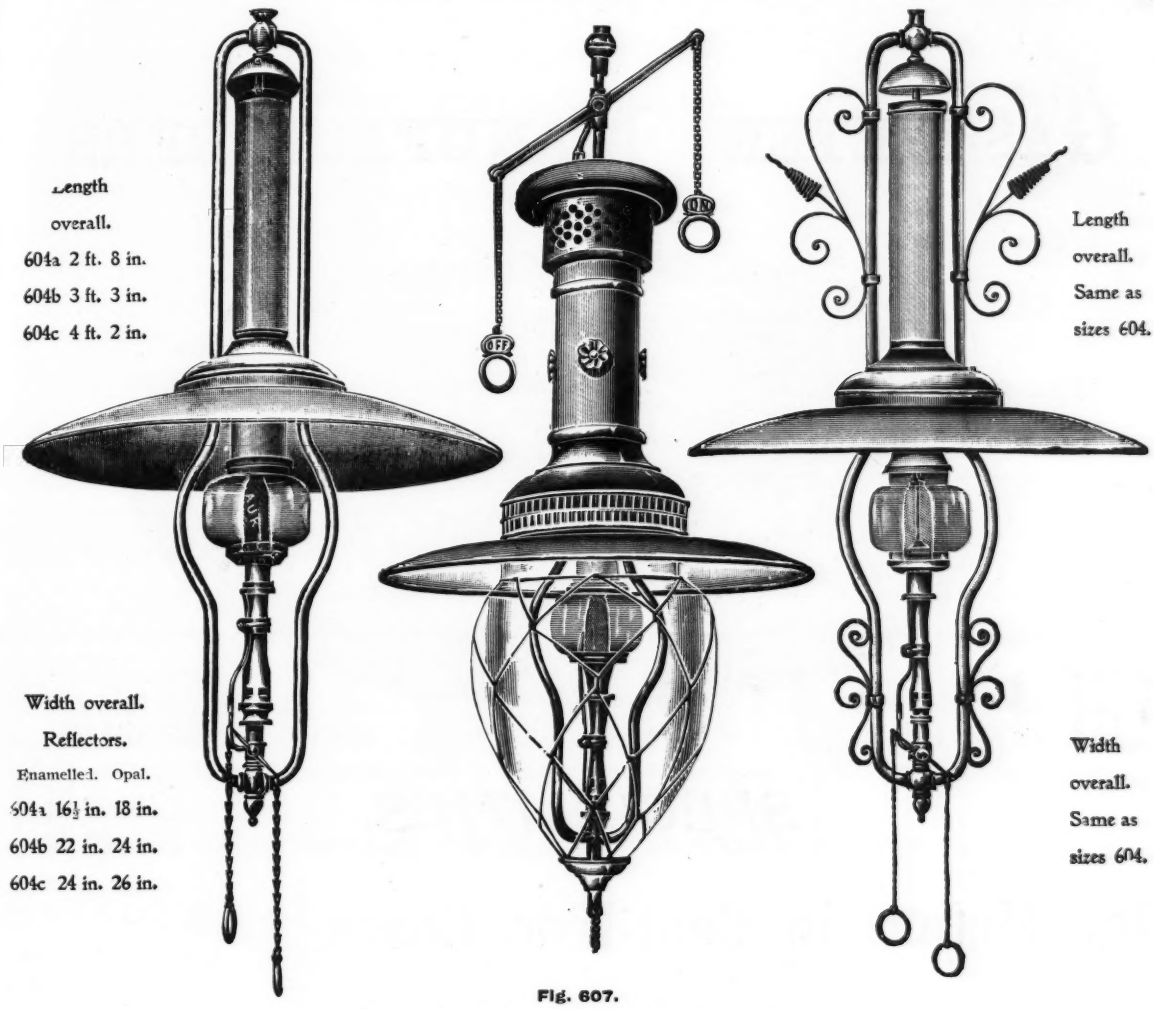

Fig. 604.

Interior Lighting. Enamelled.

A 5 ft. per hour, 150 c.p., £1 13 0
B 10 ft. „ 300 c.p., 2 8 0
C 20 ft. „ 600 c.p., 4 4 0

Fig. 607.

Overall.	Length.	Width.
607b	4 ft. 4 in.	24 in.
607c	5 ft. 0 in.	29 in.

Storm Proof Arc. Enamelled Reflector, Cup and Ball Joint, Lever Tap and By-pass.

607b 10 ft. per hour, 300 c.p. £5 0 0
607c 20 ft. „ 600 c.p. 7 10 0

Fig. 605.

Interior Lighting (Ornamental).

605a 5 ft. per hour, 150 c.p., £2 5 0
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605c 20 ft. „ 600 c.p., 5 0 0

SUBJECT TO OUR USUAL TRADE DISCOUNT.

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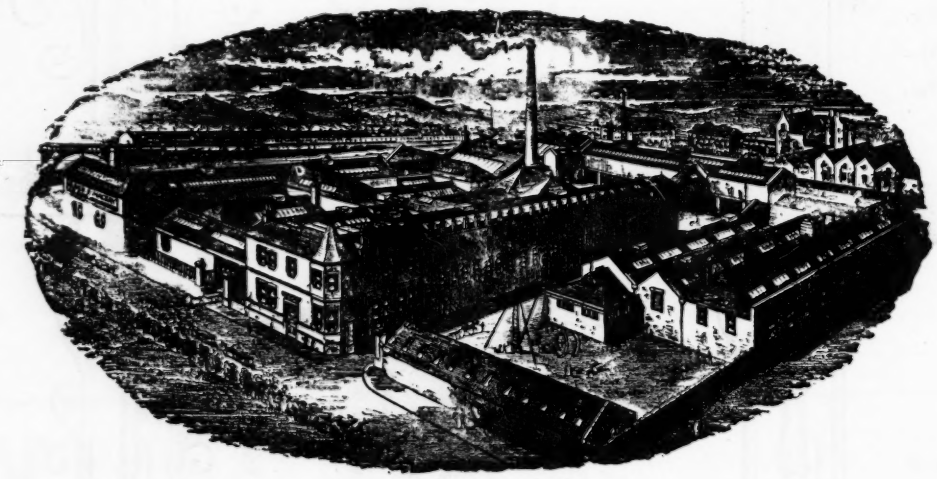

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Dry Meters in Cast-Iron Cases.

Wet and Dry Prepayment Meters.

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BRITISH MANUFACTURE.

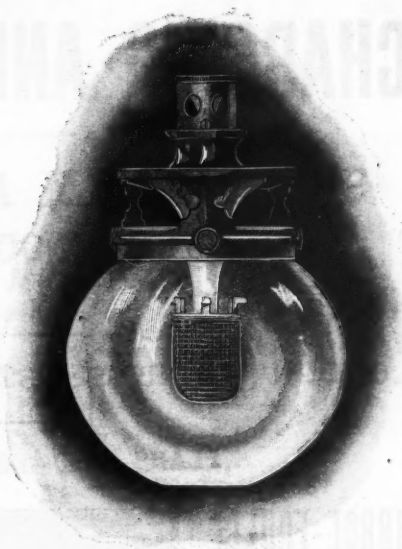
INCREASED DISCOUNTS TO THE TRADE.

New types of BURNERS at popular Prices.

MAXIMUM LIGHT WITH MINIMUM CONSUMPTION OF GAS.

The "Bijou" Burner in clusters for interior lighting has the decorative effect of Electric light at One-Eighth the cost.

NEW LISTS NOW READY.



No. 2 Burner only, in Polished Brass or Steel Bronze, 4s. 6d. Globes from 6d. each. Mantles 7s. per dozen.

No. 3 Bijou" Burner only, in Polished Brass or Steel Bronze, 3s. Globes from 4d. each. Mantles 6s. 6d. per dozen.

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We are Exhibiting at the International Gas Exhibition, Earl's Court, W., Nov. 19 to Dec. 17, at STAND No. 60. A visit will be esteemed.

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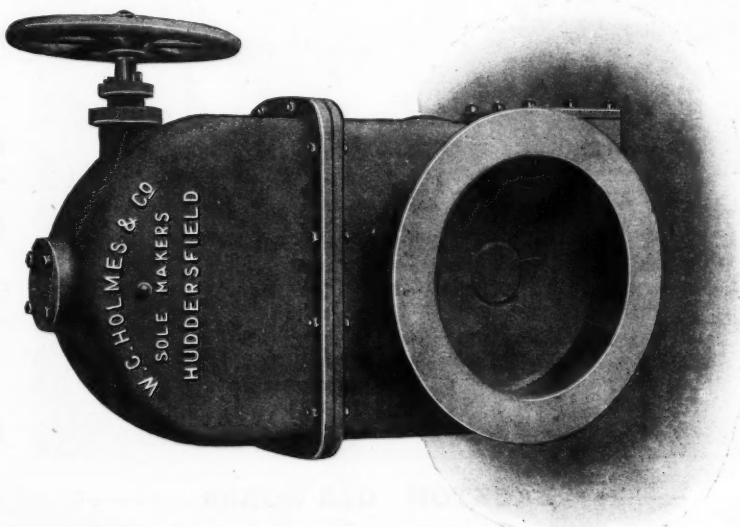
MADE IN HORIZONTAL OR VERTICAL FORM from 3 in. to 48 in.



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PATENT HYDRAULIC MACHINERY

FOR

CHARGING AND DRAWING GAS-RETORTS

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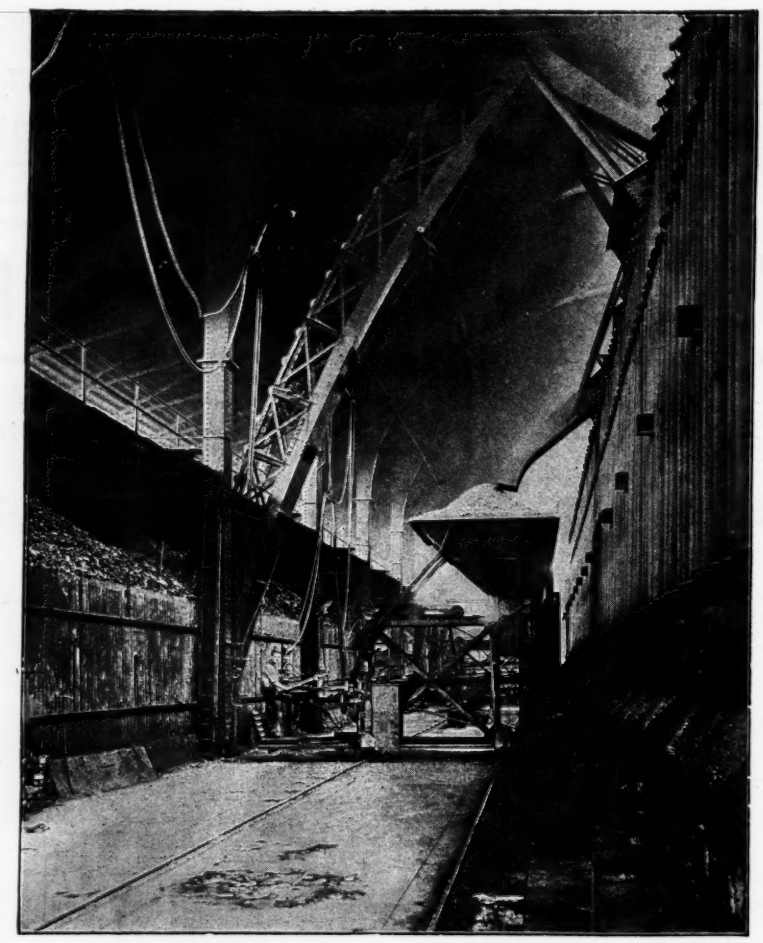

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HAGUE CORPORATION GAS-WORKS—
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NEARLY 300 MACHINES ARE AT WORK OR IN COURSE OF CONSTRUCTION.

THE TIME TAKEN TO DRAW AND CHARGE EACH RETORT BY THESE MACHINES AVERAGES

UNDER ONE MINUTE.

BOWENS' Ltd. Successors,
STOURBRIDGE.

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ESTABLISHED 1860.

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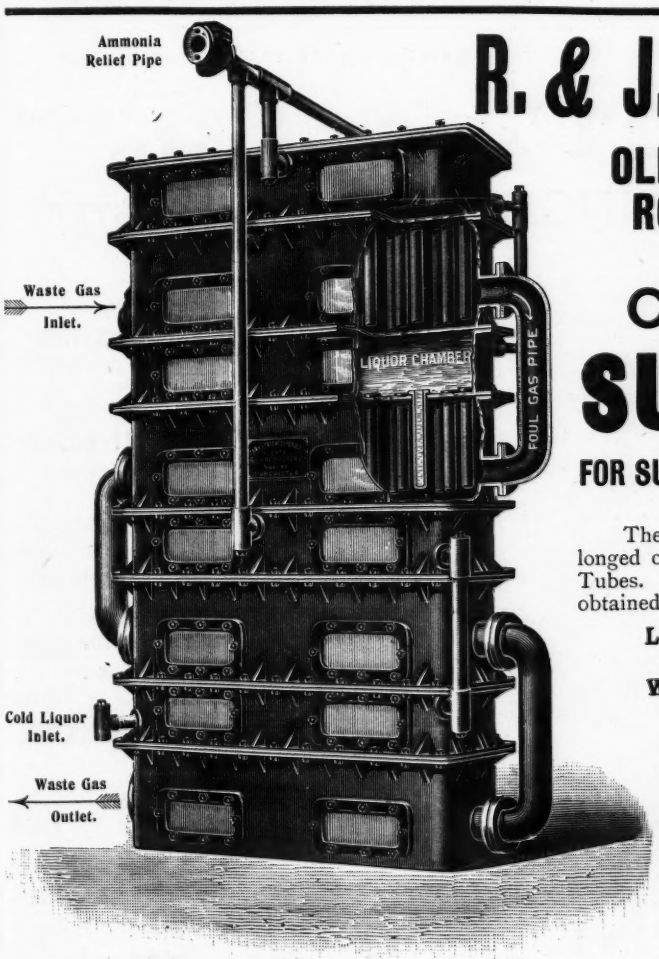

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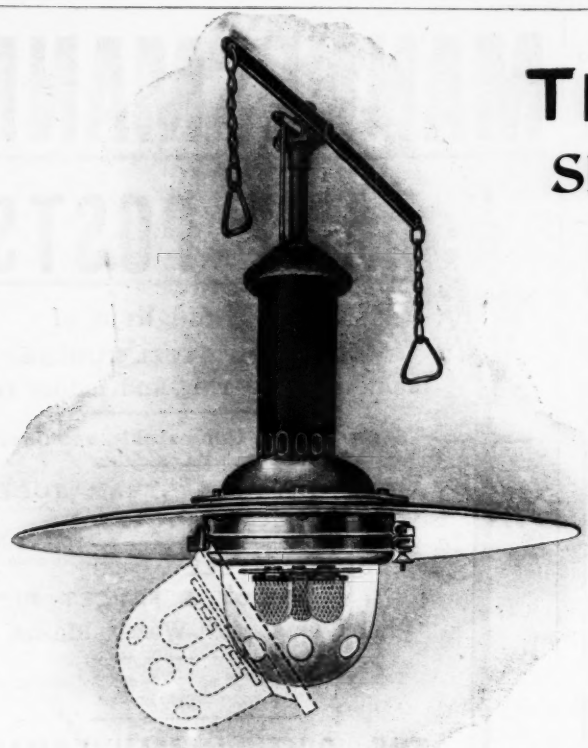

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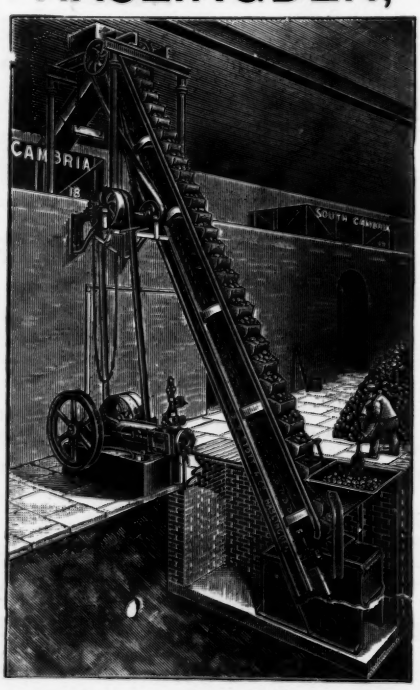

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Printed for WALTER KING, by King, Sell, and Olding, Ltd.; and Published by him at 11, BOLT COURT, FLEET STREET, in the CITY OF LONDON.—Tuesday, Dec. 6, 1904.